

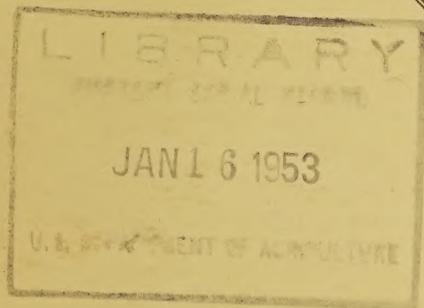
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CO-OP ELECTRIFICATION ADVISER TRAINING OUTLINE

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ELECTRIC RANGES



REA

RURAL ELECTRIFICATION ADMINISTRATION

U.S. DEPT. OF AGRICULTURE

PURPOSES OF THIS OUTLINE

This is one of a series of outlines prepared by REA as an aid in planning and arranging training schools for co-op electrification advisers. Each outline deals with a power use subject or with some aspect of cooperative principles and practice or with a particular method or technique of getting information to people. These are the three principal fields in which electrification advisers need to be skilled. Each booklet contains both suggested subject matter and suggestions as to how the material might be presented, with an indicator of a suitable time schedule. The booklet is

thus useful as a guide to committees in charge of training schools, as an aid to the instructors, and as a subject matter manual that may be distributed to participants at the close of a training session for study and future reference. Subjects available or in preparation are listed below by title and number. It is suggested that committees planning such training schools keep in mind the need of training in all three types of subject matter and, insofar as practicable, make use of the outlines in a balanced combination.

LIST OF SUBJECTS

An ORIENTATION OUTLINE (unnumbered) covers all three fields of information. It is to provide the subject matter for an initial school that will give co-op officials basic background information and an understanding of the nature and scope of the educational job to be done.

NO.	POWER USE SUBJECT	NO.	CO-OP SUBJECT	NO.	METHOD OR TECHNIQUE
1	Farm and home Wiring	100	Value of Co-op	200	Getting News to Members
2	Farm Motors		Membership		(Newsletters and State
3	Water Systems and	101	Integrating Power		Paper Columns)
	Plumbing		Use and Co-op	201	Using the Radio
4	Electric Ranges		Education	202	Co-op Reports and Non-
5	Laundry Equipment	102	The REA Program		periodical Publications
6	Poultry Production		and Co-ops	203	Making Effective Talks
7	Refrigerators, Home	103	The Electric Co-op	204	Demonstration Techniques
	Freezers, Walk-Ins		— What It Is	205	Methods and Results of
8	Small Appliances	104	The Co-op Movement		Adult Education
9	Dairying		— Here and Abroad		
10	Pig Brooding	105	Co-op Bylaws	206	Effective Meetings
11	Farm, Home and	106	Establishing Member		
	School Lighting		Ownership	207	Photography and Motion
12	Farm Shop	107	Assuring Member		Pictures
13	Pump Irrigation		Participation	208	Working with Newspapers
14	Garden Watering	108	Co-op Tax Status	209	Exhibits and displays
15	Electric Hotbeds	109	Annual Meetings	210	Working with Rural Youth
16	Elevating, cleaning	110	Co-op's Place in	211	Working with Community
	and grading farm crops		the Community		Organizations
17	Drying grain, hay, peanuts, etc	111	Cooperation Between Co-ops		
18	Heating, cooling, ventilating				
19	Cleaners, dish washers				
20	Kitchen planning				

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HISTORY

- 1761 Benjamin Franklin got idea of producing heat from electric current passing over fine wires and encouraged an English scientist, Kinnersly, to try it. The heat melted the wires.
- 1859 Electric current passing over platinum wires produced heat. Patent on this was granted to Simpson.
- 1877 During a lecture, Professor Elihu Thomson, Philadelphia, boiled eggs with heat from electricity.
- 1887 German Edison Company produced an electric teakettle.
- 1889 Carpenter-Nevis Electro Heating Company, St. Paul was formed. It made coffee and tea pots, grills and clothes boilers.
- 1890 Banquet served in England featured first complete meal cooked with electricity. Dinner for 100 using electric oven served by Windsor Hotel, Ottawa, Canada.
- 1893 At World Fair 10 manufacturers demonstrated electrical cooking appliances. Carpenter had pine and asbestos felt oven with glass door.
- 1894 London hotel served electrically cooked banquet to honor Lord Mayor.
- 1900 Toledo Fireless Cooker Manufacturing Company put electric heating unit in cooker.
- 1905 Makers placed electrical units in wooden cooking and baking table.
- 1906 Nickel-chromium alloys were found to stand high temperatures (2,000-2,646° F.) by A. L. Marsh, Chicago chemist. Fireless cookers were equipped with thermostatic control and clock.
- 1910 Manufacture of ranges started commercially with Hughes making five ranges of fireless cooker type.
- 1914 Stored heat type of range was developed. Time and temperature controls were used.
- 1915 Oven vent was put on range.
- 1920 Oven temperature control was introduced on several range models.

- 1923 The first all-enamel range was made.
- 1926 Enclosed tabular unit appeared.
- 1929 Table-top range was introduced.
- 1931 Speed heating was introduced. Basic pioneering ended.
- 1935 Moisture-proof glass seal on units was introduced.
- 1940 Automatic turn-down control of surface units was introduced first on Frigidaire well cooker, later for all units by Westinghouse.
- 1942 Ceramic surface units with high-voltage preheating and automatic timing for switching to lower voltage was developed.
- 1946 Electronic cookery entered hotel field.

HEATING EQUIPMENT USED IN HOMES IN THE PREPARATION, COOKING OR HOLDING OF FOOD

Baker (biscuit and muffin)	Lunchbox
Barbecuer	Oven
Oven-type with spit	Built-in range oven
Motor-driven spit	Infra-red cooker
Bottle (thermos)	Roaster type
Bottle sterilizer and warmer	Pasteurizer
Broiler	Percolator (see coffeemaker)
Buffet	Popper (corn)
Chafing dish	Pressure canner or cooker
Casserole	Range (see types below)
Coffeemaker	Tea cart (serving table)
Drip-type coffeemaker	Timer, nonheating (Controls heating)
Percolator	Roaster
Vacuum coffeemaker	Roaster (wainer)
Cooker	Sterilizer (bottle)
Egg cooker	Toaster
Well cooker	Toaster (sandwich)
Dehydrator	Tray
Double boiler	Urn (see coffeemaker)
Egg poacher	Wafflebaker
Fryer	Conventional wafflebaker
Deep-fat fryer	Combination wafflebaker
Frying pan	Grill and sandwich toaster
Griddle	Grill, fryer, baker, sandwich
Grill	Warmer
Hotplate (table stove)	Biscuit warmer
Built-in range units	Bun warmer
Conventional hotplate	Bottle-warmer
Combination (broiler-toaster)	Food warmer
Kettle (water and tea)	Tray warmer

Types of Electric Ranges

Household
Apartment (space-saving)
Standard table-top (single-oven)
Double oven table-top (4 to 6 surface units)
Built-in - separate surface units and oven; decentralized
Fuel-electric combination
All-electric oven
Fuel-electric oven
Portable (110 v.)
Commercial or institutional (heavy-duty)
Electronic (hotel use, to be used in homes in future)

FUNDAMENTAL PRINCIPLES UNDERLYING COOKING WITH ELECTRICITY

Electrical energy, not a fuel: An electric range gets its heat from electricity which is energy, not a fuel. This is possible because men have learned how to produce, transmit and control electricity, and how to use it to produce clean heat for cooking. Electric heat has no flame because there is no burning taking place. Therefore, there are none of the by-products of burning, such as carbon (soot), carbon dioxide, sometimes partially burned gases, and moisture vapor or water.

Resistance and heat: The wire or element in an electric heating unit is made of certain metals (about 80 parts nickel and 20 parts chromium) which have relatively high resistance to the flow of electric current.

As a result heat is produced. As the element becomes hot, the unit heats, or at least that part of it where the current-carrying wire is located, for some units consist of two coils, others of one. When there are two, it can be arranged for each of these to heat separately from the other at certain switch settings and together at other settings. Elements or resistance wires are usually protected from injury, oxidation and spillage by a tubular metal sheathing, though some open coils are used in oven and well cooker units. The sheathing is flattened on the top side of surface units in order for it to make good contact with pans.

Transfer of heat: Heat must pass from the unit to the food in order to cook it. This is not difficult for heat naturally travels from warmer to cooler places. It travels by conduction, convection or radiation or by a combination of these means.

Surface cooking: In top-of-the-range cooking, most of the heat is transferred by conduction, made possible through direct contact of the pan used with the hot unit. Some of the heat radiated downward from the unit is reflected by radiation back to the bottom of the pan. There is also a little transfer of heat by convection through heated air. Good contact between the utensil and the unit is important for the conduction of heat, and a dull surface on the bottom of the pan for absorption of radiant heat.

Oven cooking: Air circulates heat or convects it through the oven. And there is heat transfer by radiation directly from the units to pans or uncovered food in the oven. Oven walls reflect some of this radiant energy which strikes them. Cooking foods in the broiler is cooking by a direct application of radiant heat from the top oven unit.

Control of heat: Heat is controlled in an electric range by controlling the flow of electric energy. Switches or clock controls and thermostats are the means of controlling the flow of electricity. A thermostat automatically turns the electricity on and off to maintain a certain temperature. It makes use of the expansion and contraction of a liquid in a tube connected to a bellows and a switch to make and break an electrical circuit.

The range switch provides a means of connecting the heating elements in various ways so as to give different degrees of heat. The automatic timer clock can be set so that it will make and break an electrical connection. It lets current flow through resistance wires in the units controlled by it, at a time you have chosen in advance. It will also stop the flow of current at a chosen time by breaking the circuit. Timers and thermostats are used together to control oven heat automatically.

Operation of thermostat: The liquid and/or gas used in a thermostat which it controls by expansion or contraction is confined in a bulb which is connected through a tube to a bellows or diaphragm. The liquid is usually mercury under pressure of nitrogen gas in a long strong copper bulb. The pressure of the nitrogen gas keeps the mercury from boiling at the higher oven temperatures. The bulb, located in the oven, is connected through a long capillary tube to the bellows or diaphragm near the oven dial control on the range switch panel. The temperature of operation is set by setting this thermostat dial which produces the needed tension on the lever or mechanism which acts as a control device to turn the electric current on or off. The substance in the bulb and tube will expand and contract in proportion to the change in temperature. Range thermostats must be rugged enough to stand the usual handling and use and, therefore, cannot be as sensitive as those with small delicate parts used in laboratory work.

How quickly a thermostat responds to temperature changes depends on the mass of the thermostat, the location of the thermostat, the rate of temperature change and the medium in which used, which in the case of an oven is air. Although a thermostat responds more quickly to a rapid change in temperature, the lag in maintaining a uniform temperature will be greater, especially at the start of operation. Some time is required for the heat from the units to diffuse through the oven and change the temperature of the thermostat. The heating time is not great when preheating by both units or, without preheating, when some extra heat is applied in the top unit of the oven at the Bake setting in certain ranges. However, during the time of heating up to temperature set, more heat has been applied to the oven so that when the thermostat turns the heat off there is already enough heat in the oven to raise the temperature above the thermostat setting. The more rapidly the oven heats the greater will be this overrun or overshoot.

Dr. Earl McCracken, BHNHE, USDA, Beltsville, Maryland, states, "In the laboratory, after steady internal temperature has been reached, i.e., after a specified number of heating cycles have taken place, we find air temperature differentials in different ranges to vary from 25 to 45 degrees at a central point in the oven."

Information supplied by manufacturers shows the approximate variation of temperature from dial setting for a range to be -- plus or minus 10° to plus or minus 25°, with a total variation of 20 to 50° from temperature set. The highest variation is found at higher oven temperatures usually above 400°. The amount of variation commonly found has little effect on the end product.

FITTING THE ELECTRIC RANGE INTO A LONG-TIME PLAN OF FARM ELECTRIFICATION

Some factors which should be considered in planning electrical equipment purchases of any kind are listed below. These should be thought of in considering the purchase of an electric range.

General Points Related to Planning

Family size, habits, needs, goals	Equipment dimensions; space
Amount of money family can spend	Installation costs
Desirability of member's using electricity for co-op's success	Auxiliary equipment costs
Advantages of electrical equipment	Cost of remodelling needed to get full use of equipment
Importance in relation to health	Operation cost (kwh consumption)
Condition of equipment now in use	Maintenance cost
Initial cost of equipment to buyer	Money-saving or income-producing possibilities of equipment
Types available; models	Ways of financing purchases
Materials and workmanship	Value of planned purchasing
Features - uses, values, costs	

Specific Points to Consider

Reliability of manufacturer	Complete instructions
Dependability of local dealer	Sturdiness in construction
Guarantee	Durability in finishes
Servicing facilities	Simplicity of design
Safety approval (UL)	Ease of cleaning
Safety features	Convenient controls
Appearance	Plain, complete control markings

Many of the above points which relate directly to the range are discussed in the section, "Selection of the Electric Range." In thinking about the purchase of an electric range, try to fit it into the whole picture of the family's needs and wants. The range should be considered in relation to immediate and long-time goals set up by the family on the basis of its needs, and it should become a part of the planning to adopt better home management practices and higher standards of living for the family.

In electrifying the home, equipment saturation studies show that farm families in general buy lighting equipment, radios, laundry equipment, refrigerators, vacuum cleaners, some small appliances and plumbing ahead of the electric range. Because of the high time- and energy-saving value of laundry equipment and running water and the health and economy value of a refrigerator, this order of purchase has considerable merit. It is also desirable from the standpoint of operating cost, since the upper and higher cost blocks of kilowatthours in electric rates will have been consumed, thus bringing the range onto the bill in a rate block that makes electric cooking very reasonable.

The probable operating cost can be estimated easily and fairly accurately by examining recent monthly bills and studying rate structure. How many kwh are now being used monthly? In what rate block will the next additions of electrical equipment fall? Is there a special water heating rate?

Estimate range operating cost for cooking at 100 kilowatthours per month. The average amount of current used for a family of four is approximately 100 kilowatthours per month. If cooking falls in the lower rate blocks, it is quite reasonable and compares favorably with fuels.

Two important and related problems which should be considered in figuring operation cost and in making decisions related to electric range purchase are the problems of heating the kitchen and heating water.

WATER HEATING PROBLEM

A large number of high bill complaints on electric ranges are traced to using the range for heating a lot of water. When considering the purchase of an electric range, it is wise to plan how you will heat water unless you already have a satisfactory way provided. Here are some alternate means from which you can choose your water heating methods:

1. Electric storage water heater:

- a. Advantages: reasonable operating cost if properly installed; automatic so requires no attention; if large enough, furnishes plenty of water at any time; well-insulated, so does not give off extra and unwanted heat in summer; no flame, fumes or dirt.
- b. Disadvantages: higher initial cost than other methods suggested below.

2. Small, portable electric storage water heater:

- a. Advantages: low initial cost; useful without plumbing; insulated, so operating costs are reasonable.
- b. Disadvantages: small capacity (2 to 10 gallons); slow recovery in some models after hot water is drawn.

3. Electric teakettle:

- a. Advantages: portable; low initial cost; lower operating cost than heating water on range; rapid heating of small amounts of water. The teakettle provides enough water for shaving, washing hands and face, dishwashing and miscellaneous kitchen uses.

- b. Disadvantages: too small a quantity of water heated for baths, laundry, and numerous other tasks; not insulated; expensive to operate in proportion to amount of water heated; also, the teakettle often occupies valuable work space, and it will spoil finishes which are not heatproof if set on them.
4. Range boiler on present fuel-burning range. If there is room to leave the old stove with its range boiler in the kitchen without spoiling kitchen arrangement, this may be an inexpensive solution to the water heating problem.
- a. Advantage: adds no new initial cost; provides heat for kitchen in cold weather; may utilize inexpensive fuels; provides an incinerator.
 - b. Disadvantage: available hot water depends on fire in range; control of water temperature is poor; excessive scale deposit in hot water piping results from too frequent overheating; use of fuel is inefficient; boiler heats kitchen in hot weather. You might use an electric teakettle to provide small amounts of water, thus avoiding a fire in the stove too frequently during summer.
5. Range boiler on kitchen heater. If your cook stove had a range boiler attached, you can connect the range boiler to a new fuel-burning kitchen heater. Get a heater with a waterfront, or coils through the firebox. See 4 for advantages and disadvantages.
6. Converted range boiler. A range boiler can be converted to an electric water heater by strap-on units or side-arm electric or fuel heaters and strap-on insulation. While not as costly as buying a new heater, this may be unsatisfactory from an operating cost and safety viewpoint. Figure all the costs of the following:
- a. Adequate insulation.
 - b. Heat trap.
 - c. Safety releases.
 - d. Reserve storage of hot water.
- You will probably find it better to buy a regular electric storage water heater. Frequently the range boiler has been in use long enough that it may require replacement in a short period of time after conversion.
7. Furnace heating of water. With central heating, you can heat water by using the furnace for part or all of the heating during winter months. This adds at least 20 percent to fuel bills. You must also provide a means of heating the water when the furnace is not operating. Consider 1 above instead. See 4 for advantages and disadvantages of furnace heating of water.
8. Water jacketed fuel-burning heater. These are low in initial cost, but require a flue. They usually burn coal. This type does not supply heat for the kitchen.

KITCHEN HEATING PROBLEM

Introduction of an electric range into many farm homes raises a problem of heating the kitchen, for the percentage of farm homes with central heating is low. In most homes without central heating, the stove used for cooking also furnishes heat to the kitchen. If you face this problem of heating a kitchen when an electric range is installed, here are some ways in which you might solve it:

1. Separate fuel-burning kitchen heater.
 - a. Types include the pot-type laundry stove; a white porcelain enamel two-lid or solid-top, cabinet kitchen heater which matches the range; or a fuel space heater.
 - b. Fuels used may be coal, wood or cobs, oil or gas.
 - c. Cost varies widely, depending on type and finish. Learn costs locally.
 - d. Size also varies widely. The matching fuel heater is 36 inches high, about the same depth as most electric ranges and around 15 inches wide. Used with an apartment range, the two take less space than a large combination range.
 - e. Advantages include flexibility in kitchen arrangement, possibility of continuing use of a range boiler for water heater, greater cleanliness of the electric range when separated from the fuel-burning heater, weight divided between two ranges on old floors, easy removal of the heater with installation of a furnace. The small heater may later become a laundry stove, a trash burner or a heater for some farm building if furnace heat is installed. This would leave a modern all-electric range to fit into a modern, attractive all-electric kitchen.
 - f. Disadvantages. The heat from this heater can be used for surface cooking, but it is not available for oven cooking unless a small portable oven is used on top of it. While the matching heater finished in white porcelain enamel is attractive, care must be taken to keep the finish in good condition.
2. Electric range with built-in electric heater. These heaters fit into the range in place of one of the storage drawers. With them comes a fan to distribute the heat to the room.
 - a. The wattage of these heaters is high, around 2500.
 - b. Cost of heater accessory is reasonable.

- c. Advantages include attractiveness in appearance, no extra floor space required for the heater, and flexibility of use. The fan helps to cool the kitchen in summer. The heater is also interchangeable with a regular storage drawer if not needed at some future time.
 - d. Disadvantages might be inadequacy to heat a large, poorly insulated kitchen in colder climates, high operating cost in colder climates unless rates are very low, and a possibility of better location of separate smaller heaters for more satisfactory heating of the kitchen.
3. Portable electric heater. There is a wide variety of these available, and their cost varies considerably. Where cold days are infrequent, they may answer the heating problem satisfactorily.
4. Built-in electric heater. These will be satisfactory in well insulated houses, provided they can be conveniently installed for efficient heating without interfering too much with good kitchen arrangement. Their initial, installation and operation cost must be considered carefully.
5. Leaving fuel-burning cook stove in kitchen. This is an inexpensive and satisfactory solution to the kitchen heating problem, provided there is enough room to have both stove and electric range in the kitchen and to still have a well-arranged kitchen.
6. Combination electric-fuel range.
- a. Types are either all-electric oven, or fuel-electric oven. Both kinds of ovens are thermostatically controlled. However, the thermostat cannot control the heat in the fuel-electric oven if the fuel side of range is overfired.
 - b. Initial cost is usually higher than in most of the other solutions suggested above, except in 4.
 - c. Size varies widely. In the pre-war period some combination ranges were 60 inches long and extremely heavy, weighing over 600 pounds. Most present-day models are about the same size as a full-size table-top electric range. Most models are between 36 and 46 inches in length. Frequently they are as wide as 31 or 32 inches. Their weight is about 100 pounds more than a standard electric range.
 - d. Advantages include the possibility of using an existing range boiler by connecting it to the waterfront which is available for installation in the fuel-burning part, and of effecting some possible fuel economies with the fuel-electric oven.

- e. Disadvantages include extra dirt and fumes in the cooking area; possibly more heat than is needed at the range (it might be better to have the heater in another part of the kitchen); greater tendency to let flue determine range location rather than convenience of kitchen arrangement; less attractive appearance; and occasional baking problems due to overheating in preheating with fuel, to overfiring during baking, or to handling the baffles improperly. By following directions it is possible to obtain satisfactory results with the fuel-electric oven, and thus to take advantage of the heat in the fuel side. However, it should be remembered that it takes extra fuel above that needed for heating for either cooking or heating water with a heater.
7. Central heating. Installation of a heating system suitable for the climate and the kind of house and its insulation is generally the most satisfactory answer to the heating problem raised by the installation of an electric range. However, the cost may be considerable.

SELECTION OF THE ELECTRIC RANGE*

Modern electric ranges are quite attractive and do a fine job of cooking. They can be had in a wide variety of models for there are over 160 models made by about 40 range manufacturers. In any one line you may find several models that are alike in quality of construction and basic cooking features but varying in special convenience and appearance features (and consequently in cost).

It is wise to evaluate carefully the possible use of extra features against their cost. In some cases it might be better to buy another piece of equipment, such as a mixer, instead of a special range feature. This will all depend on your needs. Investigate features carefully, learn their uses, their values and their cost.

Buy a range from a dealer in whom you have confidence and one who will be able to service it if needed. Inquire about the cost of installation.

Styles of Ranges

Table-top This is by far the most common style in ranges. The cooking top is 36 inches from the floor and there is some work space on a level with cooking units.

On a table-top range pans of different size can be accommodated easily and pan handles can usually be turned away from the heat and other pans.

The oven of a table-top range is below counter height. If the oven is at one end of the range and surface units at the other, or if it is centered with surface units at either end, the oven can be placed right up against the table top with only the thickness of the insulation between. If oven is below surface units, it must be two or three inches lower. Great improvements in ovens make it unnecessary to watch baking closely so stooping in using the oven is kept to a minimum.

In most electric ranges, broiling takes place below the top unit in the oven.

The table-top range almost always has some utensil storage space, unless it is an apartment or space-saving model.

*This section is adapted with omission of gas references from "How to Choose and Use Your Gas and Electric Range," prepared by the Bureau of Human Nutrition and Home Economics. It has also been checked by the Technical Standards Division and the Power Use Section of the Applications and Loans Division of REA with their summary "Manufacturers Specifications for Household Electric Range," covering over 160 models.

Apartment or space-saving This style is designed to provide maximum cooking capacity in the smallest possible space. These little ranges are only 19 to 24 inches wide. They have 3 or 4 surface units at the regular 36 inch height with an oven below. Broiling is done in the oven, except in a couple of models where there is a broiler compartment below the single bottom oven unit. The cooking capacity is the same as in many a full sized range, but there is no utensil storage space. However, one 30-inch range has two storage spaces; another has no storage space but an exceptionally wide oven.

Double oven or large capacity For families that need larger than average cooking capacity there are ranges with six surface units. These 6-unit electric ranges have 2 ovens; also some 4-unit electric ranges can be had with 2 ovens. These are naturally higher in price--partly because of the larger size and the additional parts used, but even more because they are in smaller demand and so cannot be produced so economically as the more popular types.

An alternate solution (and sometimes a more economical one) for the family that needs increased cooking capacity is to buy 2 ranges--one regular and one apartment style, or 2 apartment ones--to use side by side. Separate units can also be used.

Ranges designed for home use should not be expected to do the job required in such places as larger school lunch rooms. Ranges built for heavy duty will give better service there.

Combination or fuel-electric For homes that need a range to supply heat for the kitchen as well as for cooking there are combinations which use electricity for cooking and wood, coal, or oil primarily for heating. These are usually larger than ranges for cooking only, and also more expensive. Another solution to the kitchen heating problem is to provide a separate heater or trash burner--perhaps one that matches the range. Some fuel-electric ranges have all-electric ovens; other combine use of fuel and electricity as sources of heat.

Separate unit cooking equipment For quite a long time designers have been exploring the possibility of separating surface cooking units and ovens. This type of equipment is now on the market. The surface units are installed at counter height. They may be used in conjunction with drawers or cabinets supplied by the manufacturer or set into custom-built cabinets. Since the oven is separate it can be placed in whatever location or at whatever height is desired. It may be placed beside the surface units making what is, in effect, a high-oven range or it may be placed some distance away -- perhaps in a separate baking unit in the kitchen. It is easy to install the ovens finished in porcelain enamel or stainless steel, but it is necessary to construct cabinets for the built-in types.

If the home has need of more surface units two sets can be used; if more oven capacity is needed an additional oven can be put in.

This type of equipment, especially if it is the built-in type, can be used to the best advantage if it can be planned into the kitchen --

either when the room is first planned or when remodeling is to be done. If the surface units and oven are widely separated duplicate connections must be provided.

High-oven Over the years there has been some demand for ranges with high ovens. At present there is no complete high-oven electric range being made; however, one can be easily assembled. (See section above on "Separate unit cooking equipment.")

The high oven and broiler are more convenient to use than lower ones. When they are near each other, the surface units may be a little less convenient than those of a table-top range because the oven blocks access to them from one side. The one in the rear corner is hard to reach and there is the problem of where to turn handles of some pans. Your hands are bound to touch the sides of an adjoining oven sometimes in handling pans, so good oven insulation is especially important.

A high oven should always be installed with the surface cooking area adjacent to a counter so you can slide pans from unit to table and can serve food conveniently without lifting pans over or around the oven. Locate the oven to right or left of surface units according to the arrangement of your kitchen. Make sure too that the equipment is so placed that the oven will not cast a shadow over the units or that there is a well-placed light on the range or above it.

If the high-oven arrangement has a large enough cooking top to prevent crowding of utensils and if the oven is full size, the whole cooking center may be wider than a table-top range with the same cooking capacity.

Heavy-duty or institutional Ranges designed for home use should not be expected to do the job required in such places as larger school lunch rooms. Ranges built for heavy duty will give better service there. Separate ovens, extra surface unit sections to add on and other institutional equipment is available to meet special needs or to expand cooking capacity. And, of course, complete ranges are made.

Sizes of Ranges

Full sized ranges are most often 38 to 40 inches from side to side. There are some for use in small quarters that are 30 to 36 inches and the still smaller apartment ones which are only 19 to 24 inches. A few double-oven ranges are as large as 43 or 44 inches and some combination ones are 46 inches or larger (combination ranges are mostly 36 to 46). Not including handles, ranges are most often 24 to 25 inches from back to front. A few are an inch or two deeper and even as wide as 31 inches in some combination models, and some are as shallow as 21 inches.

Most ranges are now made so they can be placed close against the wall and kitchen cabinets. However, some inexpensive ones may become too hot on the surfaces to be installed against walls and cabinets. The Underwriters' Laboratories* rates models for 0, 1 and 6 inches clearance in installation. Check with your electric supplier as to the installation requirements of the range you select.

*"List of Inspected Electrical Equipment," Underwriters' Laboratories, Inc., Chicago 11, Illinois.

Arrangement of Surface Units

Cluster There are usually 4 surface units--or in the case of most electric ranges 3 surface units and 1 well cooker.

The most common arrangement is a grouping of the 4 in a cluster at either the right or left side of the cooking top; in most ranges they are almost always at the left.

Divided The divided top--2 units at each end with work space in the center--is another popular arrangement. Two people can work at the range easily, and pan handles can be turned in, out of the way of passersby.

Row, or staggered Less frequent arrangements group the 4 units at the center (center cluster) leaving a small table-top space at either end, put them in a straight line (row) across the back of the range, or place them in a staggered arrangement that gives lots of room for pans on each unit but little work space between them. Still other arrangements may be found.

Construction Features

Exterior finish The finish is one of the first things that you notice about a range. Almost all are finished in porcelain enamel outside and in the oven. Notice whether the enamel is smooth and even right up to the edges. Make sure that acid-resisting enamel is used at least on the range top. Oven linings are usually finished with dark-colored enamel, though there are white porcelain enamel and chrome plated liners.

Interior finish Storage drawers and compartments are often finished in dark heat-cured paint or lacquer, occasionally in porcelain enamel. Or they may be all metal. Look to see that these parts are smoothly finished so they will be easy to clean. Watch out for exposed bolt heads that might catch cleaning cloths, or even rust. Try the drawers to see that they roll smoothly and aren't too noisy about it.

Frame A backsplash and range top formed and enameled in one piece makes a smooth top that is easy to keep clean. In many better ranges the frame is made of one piece of steel, joined by welding and reinforced by welded supports. Such construction makes a range that is strong and rigid--and will stay so. The surface of the range is smooth, with few dirt catching crevices.

Design, trim Simple design and smooth trim are most desirable from the standpoint of keeping the range looking well.

Handles Handles are most often of plastic or chrome-plated metal or a combination of the two. They should be of such a shape that your fingers need not touch hot surfaces.

Unit clearance Make sure that the electric unit will hold pans at least a fourth inch above the level of the enamel top. If large utensils are allowed to rest on the enamel or come very close to it, heat is trapped and can cause the enamel to be crazed.

Door; broiler stop See that the oven door closes tightly and firmly against the frame and that it will stay all the way open when you want it to. A broiler stop to hold the door partly open is a good feature; it prevents the door from banging if it should slip from your grasp and permits you to leave the oven door partially open when broiling or after use until odors and moisture are dispelled.

Insulation A well-insulated range is safer than an uninsulated one because the surface does not become so hot as to be a fire hazard, and it can be installed closer to walls and cabinets. It is a far more comfortable range to use since it keeps the kitchen cooler and does not become too hot to touch. Though insulation may have little effect on the cost of baking for short-time jobs, it does enable the oven to operate more economically whenever it is used over longer periods of time. Insulation is something you can't see so you will have to ask about it. Electric ranges are generally quite well insulated on all 6 sides of the oven.

Vent Look for the location of the oven vent. It should direct moisture-laden air out into the room and not against kitchen walls. Grill work over a vent is harder to keep clean than a smooth opening.

Thermostat Electric ranges come equipped with thermostats to control oven temperatures. These thermostats are usually of the hydraulic type.

Safety Approval; Guarantees

On an electric range look or ask for the Underwriters' Laboratories seal--an assurance that the range is safe.

Most manufacturers guarantee their ranges against defective materials and workmanship for stated periods. Ask about these guarantees.

Heating Units

Since the primary purpose of a range is to produce heat, the units that do the job are of first importance.

Wiring Electric ranges are designed to work on an electric supply of a different voltage (usually 118/236); ask your electric supplier whether this voltage is being maintained. Then make sure that the wiring in your own home is adequate so the full power will be delivered to your range. Unless your range is supplied with a steady full voltage it will not operate satisfactorily.

Surface units Few open coil surface units are used any more. (Some of this type are found in well cookers.) Most of them now are of spiral flattened tubes with the heating wires sealed inside. One or two manufacturers furnish ring and solid cast-in units on request and open units are available from one manufacturer on the same basis. The closed tubes are less subject to damage than open coils and are easier to clean. The unit may consist of a single tube or there may be two; if two, the area covered by one is smaller in diameter than the other.

Modern electric units have much greater flexibility than earlier ones and they respond more readily to a turn of the switch. These units heat quickly and because there is not so great a mass of material in them as older ones had, heat can also be reduced quite rapidly. Very low heats are obtainable on any unit for slow cooking or keeping food warm.

Usually there is one unit about 8 inches across; this is designed to be used for fry pans and large pots and kettles. The other units are 6" across and are for the smaller utensils. If a unit has two tubes the one covering the smaller area in the center can be used for such small diameter utensils as coffeemakers and little pans. The diameter of this center area in the small unit is about 4 inches; for the large unit, it is about 6 inches.

Well-cooker unit The well-cooker, found on most electric ranges, has a unit in the bottom of a well which is usually insulated. Tube and open coil types are used. In a few cases the heating unit is around the sides of the well. On some ranges the well-cooker unit can be raised to a range-top position to be used as a regular surface unit when the deep kettle is not in use. The kettle which fits into the well has a capacity of $2\frac{1}{2}$ to 9 quarts, though most are 5 to 7. This cooker is primarily designed for long, slow cooking but some newer high wattage units and various accessories make it usable too for steaming, cooking whole meals, deep-fat frying and sometimes even for doing small amounts of baking.

Surface heats Most surface units provide at least 5 heats, some 7 and a few an unlimited number. Large units usually have a maximum wattage of 1,750 to 2,200, regular-sized units 1,000 to 1,300. The wattages of the well-cooker though usually lower may be just as high as other units. Well-cookers range in wattage from 750 to 2,100. The higher wattage ones are often lift-up surface units.

Oven units Electric ovens commonly have two units, one in the top and one in the bottom.

Oven units are frequently of the open coil type; some are of the closed tubular type. Wattages of oven units are quite variable, but 4,000 to 5,000 watts are commonly used during preheating. High wattage units are not necessarily more costly to operate than others because they may heat the oven faster and so be on for shorter periods.

In some ranges both units are used at once for preheating the oven, then the bottom unit -- with perhaps a small part of the top one -- is used to maintain the baking temperature. In other ovens the bottom unit -- either alone or in combination with a part of the top unit -- is used for both preheating and baking. When baking is done without preheating the oven the full top heat is never used. The top oven unit also serves as the broiling unit. In a couple of single unit ranges, the bottom unit serves also for broiling, one having a drawer space below for broiling.

Ovens and Broilers

Though ovens and broilers are used less than the range top, the food from them is often judged more critically. Whether a woman bakes frequently or rarely she wants the results to be good. Broiling seems

to be a matter of habit; for one woman the broiler is a very important part of the range; another might use hers more often if it were more convenient; and still another would make little use of the broiler no matter where it might be.

Heat control or thermostat An important feature of a good oven is good heat control. Not only must the thermostat keep the temperature at the correct point but its dial should be one that you can read easily and set accurately. With a good control on the job there is rarely any need for attention to food during the greater part of its baking time.

Oven shelves or racks Most ovens can be expected to do their best baking when foods are placed about the same distance from top and bottom of the oven. Because pans vary so widely in size and shape and because the number of pans that you use at once varies so from time to time, you need an oven that is flexible in its arrangement. The more positions there are for oven shelves, the easier it will be to find the best arrangement for any foods you want to bake, always leaving room all around the food for circulation of hot air. Sometimes one rack is made like a very shallow wide "U" which can be used either side up. This too adds to the flexibility of oven arrangement.

Shelves should slide forward with ease for placing, testing or removing food. They should not tip as they are pulled out and should have a secure stop to keep them from being pulled too far. Of course the empty shelves must be easy to remove in order to change their position. Check for a wire arrangement or bar to prevent utensils from sliding off the back when loaded shelves are pulled forward.

Shelf supports that are pressed into the oven lining are smooth and easy to clean. A few are removable, being hung on the side walls of the oven liner.

Oven vent An oven vent is needed to carry off moisture so food can brown well. The vent may open on the front of the backsplash or on some electric ranges it opens under one of the surface units, or through the porcelain enamel cooking top.

Sizes of ovens Oven sizes vary quite a little but in a full-sized range the oven width should not be less than 16 inches. The depth (front to back) is 18 to 20 inches. Height may vary from 12 to 18 inches but in looking at the height of the oven, remember that the usable space is that between the shelf in the lowest position and the top of the oven or the bottom of the top electric unit if there is one.

Heat distributors The lower unit of an electric oven is partially covered by a plate which helps distribute heat evenly. This is usually removable for easy cleaning.

Broilers In the electric range the oven is also the broiler. Because of the oven height, food can be placed any desired distance from the heat. In a range with two ovens either can be used for broiling.

In one electric range the broiler is under the oven, the same unit serving both. The broiler in this case is low.

Most broilers because of the top location of the units have enough height so roasting as well as broiling can be done in them. Exposure to the direct heat gives a nice browning to the surface of the product.

The broiler pan and rack in any range should be designed to drain fats quickly away from meats and then protect them from direct heat to prevent spattering and smoking. Broiling racks are of enamel or metal. The openings are most often slits or holes, though some are of other designs. Wire racks are used frequently. The pan beneath the rack catches the drippings.

Convenience Features

Many convenience features are a matter of personal choice--what is handy for one homemaker may be unhandy for another. The various features described here are found on different ranges, though not all on any one range. It is for you to decide which ones will be of the most help to you and worth the price if they add to the cost of the range.

Location of switches The switch panel of a range may be either on the front or on the backsplash, or part of the controls may be in one place and part in the other. At the front of the range they are easy to reach (possibly too easy if there are small children around) but they are not so easy to see clearly as you stand close to the range and look down on them. On the backsplash controls are easy to see but may not be so easy to reach if the range top is covered with utensils. Controls on the backsplash should be so located that you will not have to risk touching hot pans to reach them.

Switches are usually shaped or trimmed to make it easy to see whether they are in an "on" or "off" position. They should be marked to show which unit they control. Electric switches are marked to show which heat on any unit is being used.

Thermostat dial On many ranges turning the oven thermostat to the desired temperature turns on the electricity at the same time, but on some the oven switch and thermostat dial are separate. In the case of either the single or double control on an electric range the high wattage used for preheating may be automatically reduced to a baking wattage when the oven has reached temperature.

Outlets Electric outlets are found on electric ranges. These are for any of the electric appliances that you may want to use near the range. If the outlet can be controlled by the timer you can, for instance, put coffee and water into an electric coffeemaker, plug it in and set the clock so that your coffee will be ready and waiting when you reach the kitchen in the morning. Often there is both an ordinary (manual) outlet and an automatic timer controlled one. On a few ranges an electrical time signal is also a time control for an outlet.

Lights Indicating lights on electric ranges show when any unit is on. These can be seen from a distance so you can tell from across the room whether any heat is turned on. The oven signal light on an electric range serves the added purpose of showing when the oven has heated to baking temperature.

A range lamp on top of the backsplash is a convenience, especially if the kitchen does not have good lighting, though a well placed room light may do a better job. A light at the range back needs to be high enough to throw light into tall pans. Some of these lights are now fluorescent tubes which run the full width of the range.

An oven light helps to show what is happening in the oven; the light comes on as you open the door. If the oven door has a glass window the light can usually be turned on by a switch so oven contents can be seen without opening the door.

Oven windows An oven window is a feature well liked by many women because it permits them to observe baking without opening the oven door.

Time signals and time controls A time signal that can be set to ring at any time up to an hour (on a few ranges up to 4 hours) can relieve you of much clock watching.

Sometimes confused with the time signal--though serving an entirely different purpose--is the automatic time control or automatic timer. It can be had on most electric ranges. A clock is used which can be set to turn the oven on and off at whatever time you select. On some ranges it can be used to control the wall cooker, an outlet, or one or two surface units.

Features for ease of cleaning Anything which makes it easier to keep a range clean is a convenience.

Removable drip trays under surface units should be easy to take out, easy to handle.

Electric surface units of the tubular types are practically self-cleaning since most food spilled on them chars and peels off, but it should always be possible to lift or tilt these units easily in order to remove and wash the reflector pans below and the metal rims around them.

Reflector pans on electric ranges are designed primarily to reflect heat to the utensils but they do catch spill-overs too.

It should be a simple matter to put both reflector pans and units back in the right position in the range after cleaning it.

Storage space In building surface units, ovens and broilers into a smooth attractive range cabinet there is usually some space that can be utilized as storage for pots and pans. Double-oven ranges have less storage room than single-oven ones. The space may be in the form of drawers or shelf space with hinged doors. There are also a few full width tip-out bins. The shape of the space determines to a large extent what can be stored in it.

To determine the actual cost of storage space in a range compare two models that are the same otherwise. If you do not need the storage space the cheaper range--perhaps an apartment or space-saving model--may serve you just as well and at a lower cost.

Warming compartments These are optional features on many electric ranges. In most warmers the temperature is manually controlled by a switch, but a few have thermostatic control.

Cooking charts Charts giving cooking times and temperatures are found on some ranges. These may be located in the backsplash or fired into the enamel of doors or pull-out drip trays.

Extra Features

Interesting new features are constantly appearing on ranges. Often an idea introduced by one manufacturer is adopted by others and so comes into general use. It is always worthwhile to give consideration to these extra features and to decide whether they will make the range more useful to you. You can determine what they cost by comparing the prices of different models of the same make.

On electric ranges you may find these and other features:

- An oven heating unit that is tilted up instead of removed for oven cleaning.

- Recessed upper oven unit. Recessed lower oven unit.

- A lower unit located outside the oven. It is below the liner.

- Broiler rack usable also as a roasting rack.

- Broiler pan shaped to fit surface unit for gravy making.

- Glass lid or window in well cooker kettle. Window in oven door.

- A thermostatically-controlled well cooker that can be used for small baking jobs. This is a portable cooker of a plug-in type - leaving four free surface units.

- A switch that automatically turns the well cooker unit to "simmer" after the time you have set for it to remain on "High".

- Pressure cookers to be used in place of the well cooker.

- A built-in roaster or griddle.

- Built-in electric kitchen heater or fan-type cooler.

- Plate rack in warming compartment.

- A tilting backsplash to give easy access for servicing.

- A switch which prevents small children from turning units on.

- Pushbutton switches instead of the usual rotary ones.

- Colored lights to indicate which heat of any unit is being used.

- Built-in range levelers.

- An adjustable range lamp.

LOCATION OF RANGE

The range is the heart of the cooking and serving center of the kitchen. In a well arranged U- or L-shaped kitchen the range stands at the left end of the kitchen food production line. The refrigerator stands at the right end, as seen when facing the production line. The sink lies between on one point of a nearly equilateral triangle. The fact that working from right to left speeds work for the right-handed person forms the basis of these recommendations. You can keep this general rule in mind in planning arrangement of the equipment in the two-wall corridor kitchen, also called a strip or pullman kitchen.

In addition to the range, the cooking and serving center should have room for serving food, and some space for storage. The serving space may be built-in; also useful is a movable tea-cart. It is desirable to have the cooking and serving center fairly near the dining room or main eating space.

Near the range you should store all equipment which is used there first. Arrange storage space for saucepots and fryers, with rack space for their lids; space for some flour, seasonings, coffee, tea, cereal, dried foods, measuring cups, cutlery. Plan room nearby for tray storage with trays on edge and space for serving dishes and platters. You can put cupboards above the range. If you start them 24 inches above the range, you can have some narrow shelves below, between the backsplash and the cupboards. Put much-used seasonings and foods here.

For more ideas and some pictures of a conveniently arranged kitchen with a good cooking and serving center, send 10 cents to Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for a copy of "A Step-Saving U Kitchen," designed by the Bureau of Human Nutrition and Home Economics. Also get kitchen planning bulletins from your state college. Ask your local county home demonstration agent for this material.

INSTALLATION OF RANGE

Correct Voltage: The satisfactory performance of the electric range depends largely upon proper voltage being available at the heating elements. If the range circuit from the distribution panel to the range location is too small to carry the connected load of the range, or if the length of the circuit is too long, the voltage drop might be too great, and the elements will heat slowly. It is easy for a person just having a range installed and unfamiliar with its proper operating characteristics to have this condition and not to be aware of it. However, the range will not be performing at its highest efficiency. The operation will not only be slow, but also the operating cost will be higher than it should be.

3-wire #6: All electric range circuits should be a minimum of 3-wire #6 conductor regardless of the total connected load. For example, an 8,000 watt (or 8 kw) range would require approximately 35 amperes at 230 volts. Referring to table 1, chapter 10, page 329 of the 1947 edition of the National Electrical Code, the #8 conductor will carry 40 amperes, which is 5 amperes greater than the connected load of the range. However, to insure satisfactory voltage, a 3-wire #6 conductor should be installed.

Range Circuit: The distribution panel should have a separate range circuit with over-current protection. The range circuit may be 3-wire service entrance cable and should terminate at a 3-wire, 50 ampere polarized outlet for the connection of a range cord.

Range Cord: The range cord should consist of 2 #8 and 1 #10 conductors with insulation equivalent to type K Cord. One #8 is colored black, the other red and the #10 white. This size cord is to be used on ranges with a connected load up to 8,500 watts. For all ranges over 8,500 watts connected load, a cord should be used consisting of 2 #6 and 1 #8 conductors. The frame of the range should be grounded to the grounded neutral wire of the circuit. The neutral is the #10 white in the cord for ranges under 8,500 watts and the #8 white in ranges of over 8,500 watts connected load. The ground wire should not be smaller than #10 copper wire.

Main Service Entrance: All standard type electric ranges require a 3-wire 115/230 volt main service entrance. In the past when surface units had three speeds the surface units and most oven and broiler units operated on 120 volts. However, now in some models the oven and broiler units, and at some speeds, surface units are 230 volts. A 3-wire 115/230 volt range circuit is installed and the connections in the range provide for the proper operating voltage at each heat which is available in each heating unit. Use 60 amp. or larger entrance.

Transformer Size: Range and/or water heater installations should not be made on transformer size less than 3 kva. Size of load and distance determine transformer size and size of wires running from main power line to house.

POINTS TO CHECK ON NEW RANGE INSTALLATION

Removing labels: Remove labels before using range. Soak with cloth dipped in warm water. Rub with cloth until removed. Do not use sharp instrument.

Checking levelness: Check levelness of range by using water in a flat-bottom pan. Note the distance of the water on all sides in relation to edges of the pan. Or use a level at various places on the surface and in the oven of the range. Place wooden pieces or metal discs under corners of base on low side. Some ranges have adjustable levellers; turn these until you get water in pan level or bubble in level centered. It is important to have oven shelves level.

Checking oven temperature: Use an oven testing set or a tested oven thermometer, or two, to check the oven. Follow directions accompanying the oven testing set and the manufacturer's range service manual. If using a thermometer, follow instructions for using a thermometer to test oven temperature, in range instruction book or service manual. If there are no instructions, try this:

1. Place 6-inch tested oven thermometer on an oven shelf as close to center of oven as possible. Or use two thermometers, one as a check against the other. (If there are any great differences in reading, still another thermometer will be needed.)
2. Close oven door.
3. Set heat control dial at 400° F. and turn any additional control to baking position. This causes the bottom unit only to operate, or the bottom unit and the baking coil of the top unit. Use of preheating may boil mercury in thermometer if temperature should go very high.
4. Allow thermostat to open circuit at least three times before reading the thermometer. This will be indicated by the operation of the oven signal light. The light will come on showing the circuit is closed and then go off showing it is open. Three cycles will take about an hour.
5. Open oven door and quickly read thermometer or thermometers. Use a flashlight to see reading quickly and accurately. If the thermometer reading is within 25° F. either above or below the dial reading, no adjustment is needed. If the variation exceeds 25° F., call the dealer.

Instructions for checking oven temperature vary considerably. Some instructions suggest using automatic preheating and checking at 350° F. Others suggest to check temperature, using automatic preheating and reading when thermostat cuts off current at settings of 200, 300 and 400° F., or 250, 400 and 500° F. in succession.

The most accurate method is to use a normal baking position and take a reading at the end of each of 3 cycles after 3 uninterrupted cycles for temperatures of 150, 250, 400 and 500° F. With an average temperature for 3 cycles at each of these main settings, you get a good picture of how the oven is operating. However, this takes a long time.

Accuracy in checking oven temperature: Cooking tests, such as baking layer cake in the oven, are a good way to check whether an oven is operating correctly. In case of complaints, it is a way to determine whether the complaint is based on poor utensils or poor recipes rather than on oven operation. Standards and recipes for this type of test have been developed by the Bureau of Human Nutrition and Home Economics, USDA, Washington 25, D. C.

An oven testing set permits one to read temperatures inside the oven without opening the oven door. The temperature indicating dial is in a small box and can be placed on the surface of the range; fine wires connect it to the interior and center of the oven and the door can be closed on these wires. Directions accompany the set and usually suggest that the wires be brought out at the side and toward the bottom of the oven door. When directions are followed carefully, a fairly accurate check can be made with an oven testing set.

Checking temperature by an oven thermometer is likely to be inaccurate for several reasons: inaccuracy of thermometer, error in reading thermometer, delay in reading thermometer, change in temperature due to a draft of air striking thermometer.

The main advantage of using an oven thermometer for checking is the low initial cost of the thermometer compared with an oven testing set for it costs about 1/10 as much. A good thermometer should serve only as a rough guide, an indicator as to whether a further check with an oven testing set should be made before some adjustment is made.

NEMA cooking tests: Cooking tests for checking oven operation, suggested in NEMA* test specifications, are given below:

Baking - Perform the following baking operations using good utensils and methods recommended in the manufacturer's cooking instructions:

Low temperature - baked custard.

Medium temperature - four pans of butter layer cake (8-inch diameter).

Medium high temperature - 2 fresh fruit pies, of 9-inch diameter, double crust (apple suggested).

High temperature - a 10x14 inch flat aluminum sheet loaded with baking powder biscuits.

The oven door should not be opened between the time of starting and completing each baking operation.

Oven meal - Cook the following oven meal using good utensils and methods given in the manufacturer's cooking instructions:

Meat loaf - 1 pound veal, 1 pound beef, other ingredients.

Baked potatoes - total weight $2\frac{1}{2}$ pounds (uniform baking potatoes approximately 3 to a pound).

Buttered beets - approximately 1 pound (medium size) cut in cubes.

Apple pie (9-inch diameter).

Broiling - A sirloin steak approximately 1 inch thick weighing 2 pounds, following manufacturer's cooking instructions for a rare steak. This steak should not be colder than 45° F.

*"Test Specifications for Household Electric Ranges," NEMA, 155 East 44th Street, New York 17, New York.

Calibrating thermostat: If there is a competent dealer or a trained serviceman get him to check and calibrate the thermostat properly. Until this is done, change the setting the proper amount as determined by checking the oven temperature. If this is impossible, secure the range service manual and follow suggestions. For example, steps might include ones like these given for one type of thermostat:

1. Follow all steps under "Checking Oven Temperature." Determine number of degrees thermostat is incorrect.
2. Remove thermostat dial.
3. Loosen set screws near dial post. Turn adjustment screw or calibrating plate proper amount. ("L" for Lower, "R" for Raise; each notch represents 25° F. - on one type.)
4. Tighten set screws.
5. Replace thermostat dial.
6. Recheck oven temperature.

There are many types of thermostats used on different models of ranges made even by the same manufacturer. It is advisable to secure the proper service manual for the particular range model before proceeding.

LIGHTING THE ELECTRIC RANGE

Range lamps: Most ranges come equipped with range lamps, or lamps are available as accessory equipment. A range lamp contributes some lighting to make any controls located on the backsplash more easily visible, and it gives light toward the back of the range. When used alone few are located high enough to provide the light needed at the front of the range or inside utensils on top of the range. However, a few new ones are adjustable in height.

Glare: Poorly designed range lamps sometimes produce glare by direct reflection of light from the porcelain enamel or from chromium trim. Use of ceramic white bulbs may help to correct this. Also increasing the general lighting in the room or local lighting above the range will sometimes help.

Ceiling fixture: General lighting from the ceiling helps to light the range. This is especially true if the fixture is a fluorescent type built all around the room, above all working areas. A ceiling light helps a lot if it is above the cooking and serving center either on the ceiling, or behind diffusing glass as in a soffit or recessed installation.

Pin-up lamp: A pin-to-wall lamp well above the range gives good lighting on the range. It should have a metal or plastic shade for easy cleaning since it is in a place where there is usually a little moisture and grease from cooking. Or use a shielded pin-up fluorescent above the range. Connect pin-to-wall lamps to a lighting circuit or 15-ampere circuit.

Under-cabinet lighting: If there is a cabinet above the range, under-cabinet lighting is a highly satisfactory means of lighting the range surface. Here, it is possible to use a pin-to-wall or permanently installed fluorescent lamp. Buy shielded type or shield the tube from sight under the cabinet or with home built shield of wood or metal.

UTENSILS FOR COOKING ON AN ELECTRIC RANGE

By knowing the principles or fundamentals underlying cooking with electricity, it is a little easier to know what utensils are most efficient in surface and oven cooking.

Surface cooking. Here are some characteristics of good utensils for cooking on surface units:

1. Correct diameter to fit unit, or part of unit being heated - to prevent heat loss around sides of pan.* The pan should also fit the food being cooked, not being either too large or too small for the amount of food commonly cooked in it. Here is a guide:

6-inch unit - 2 or 3 quart pan, 6 or 7 inches across
8-inch unit - 4 to 6 quart pan, 8 or 9 inches across
4-inch coil - 1 or 2 quart pan, 4 or 5 inches across
 2. Conductive material, such as aluminum - to conduct heat rapidly and evenly.
 3. Medium weight - to lessen denting or warping, thus keeping bottoms flat. In general, aluminum pans of medium gauges are more efficient thermally than pans of thickest and thinnest gauges.
 4. Flat bottom - to make contact with unit for rapid conduction of heat through pan. Dented or warped bottoms can often be flattened.
 5. Dull finish on bottom to absorb rapidly the heat reflected by radiation from reflector pan under unit to pan on unit.
 6. Straight sides - to lessen surface area for loss of heat by conduction of heat to air and convection by air away from pan.
 7. Shiny sides - to decrease loss of heat from sides of pan by radiation.
 8. Tight cover - to decrease heat and moisture loss through convection. A shiny cover lessens heat loss from top of pan by radiation.
 9. Light-weight vent - to indicate steaming readily so you turn heat down. This is a desirable but not a necessary feature. Steam will escape around the edge of the cover. Time cooking carefully, or feel of cover to check progress of heating.
- *Pan is used here for kettle (bailed handle), pan (single handle) and pot (two handles).

10. Flat cover - to permit pans to rest on top of each other on units after brought to steaming, also to prevent interference of cover knob with oven shelves during use in oven.
11. Short side handles - to prevent accidents through hitting handles or catching with apron, and to allow convenient arrangement in oven. However, it may be a little easier to burn your hands with shorter handles, especially if of metal. If handles are heat proof, pans can go in oven.

(Avoid flanged or recessed bottoms for they may trap heat, especially if they overhang the unit. This will cause over-heating and checking of porcelain enamel around unit.)

Oven cooking: It is economical of money and storage space to have oven and surface utensils interchangeable inasmuch as possible. For this reason, buy utensils with heat proof handles.

1. Steaming - utensils with tight lids to prevent loss of moisture.
 - a. For short-cooking meals - enamel, glass or cast iron for rapid absorption of radiant heat.
 - b. For long-cooking meals - bright metal slows cooking rate and prevents overcooking of root vegetables used in timed oven meals. The shiny finish reflects radiant heat instead of absorbing it so readily, thus food in pans cook more slowly.
2. Baking - uncovered utensils for most baking; covered casseroles for cobblers in long-cooking timed oven meals to slow their browning.
 - a. For thick crust; well-browned crust; rapid baking - enamel or glass, to absorb heat readily.
 - b. For thin crust; long, slow baking - aluminum, other bright metals - to reflect heat and prevent too rapid absorption and browning on bottom before browning takes place on top.
3. Roasting:
 - a. For tough meat - covered utensil. Can be any material, temperature inside is 212° F. because of moisture present.
 - b. For tender meat- uncovered shallow pan. Since pan is placed near lower unit and meat rests on its own bone or a rack, a bright metal pan is better if higher temperatures are used. This helps prevent chance of browning drippings too much. In roasting at recommended temperatures, enamel, pottery or glass hasten heating by absorption of radiant heat from unit more rapidly.
4. Broiling - use the pan provided with the oven, and put food on rack unless food might break easily in turning.

COOKING VEGETABLES, FRUITS, AND GRAINS OR CEREALS
ON SURFACE UNITS OF THE ELECTRIC RANGE

Summary: To cook fruits and vegetables economically and healthfully, use medium weight utensils with flat bottoms and tight lids, little or no water, a timed fast start on High heat, Low and/or Simmer and possibly some stored heat for finishing. Time cooking carefully and serve food promptly. Throughout the preparation and cooking process, whenever possible avoid exposing food to those vitamin destroyers--air, heat and water. Avoid lifting the lid; if attention seems necessary, shake the utensil sidewise instead of opening and stirring. Here are suggested steps and some reasons for them:

Fresh vegetables or fruits:

1. Choose the proper utensil for the amount of food being cooked and the unit to be used in cooking it. For economy, use small units whenever possible:

6-inch unit -- 2 or 3 quart utensil, 6 or 7 inches across.
8-inch unit -- 4 to 6 quart utensil, 8 or 9 inches across.
4-inch coil -- 1 or 2 quart utensil, 4 or 5 inches across.

A pot or pan that fits the unit, or is slightly larger, permits little loss of heat around its sides. Choose a utensil with a flat bottom, straight sides and tight-fitting lid. This type utensil makes good contact with the unit and loses little heat from its sides or through its lid.

2. Add 2 T. fat, 2 T. water to pan. Or use $\frac{1}{4}$ to $\frac{1}{2}$ cup water. Instead of part of the water, put in the bottom of the pan one or two tablespoons of butter, margarine, cooking oil, or for some vegetables, bacon fat or meat drippings. The fat flavors the food while cooking, lessens the possibility of food sticking and permits the use of less water. With the fat, two tablespoons of water is plenty of moisture. Heating the fat with the food frees you of that last minute rush of seasonings. This rush often results in stirring, exposing food to air, breaking and cooling of the food.

By measuring and always using the same amount of water you have some idea of the time required for steaming, for it will be about the same each time. A small amount of water steams quickly and saves vitamins, minerals and electricity. Lemon juice or vinegar may be used instead of water with some foods. Heating with acid may save some of the vitamin C but is destructive of vitamin B₁₂ found in significant amounts in green leafy vegetables. It also tends to prevent softening and may cause an olive green color to develop. Add to green vegetables just before serving. No water or fat is needed for tomatoes, juicy fruits such as rhubarb, plums or apples, or for greens. Plenty of water clings to the leaves of greens from washing them.

Use more water and no fat for artichokes ($\frac{1}{4}$ - $\frac{1}{2}$ cup), corn on the cob ($\frac{1}{4}$ -1 cup), whole unpeeled potatoes ($\frac{1}{4}$ - $\frac{1}{2}$ cup), and winter squash ($\frac{1}{2}$ -1 cup). If using over $\frac{1}{4}$ cup water, add boiling water to the food, or heat the water on High to steaming in the pan before adding the food. In this case omit steps 3, 4, and 5.

3. Prepare and put food in pan. Wash food thoroughly, rinse and then, if necessary, peel and cut in uniform pieces. Do all this quickly, remembering that the less contact fruits or and vegetables^{have} with water and air the better, especially after cut. Washing thoroughly is unnecessary with refrigerated foods which were thoroughly cleaned before putting in the refrigerator; just rinse and prepare, or prepare only.
4. Put pan on unit to be used. Choose rear unit frequently, as front units tend to be used more often than rear ones. This also frees front units for cooking which requires some attention, as do white sauces. Note unit wattage, size.
5. Turn switch to High. Put the pan on the unit first and turn the switch afterward to prevent loss of heat. A unit heats quickly on High and thus brings food quickly to steaming. If you are using the 4-inch center coil of a unit for a small pan, use the switch position which turns it onto its highest heat; see your instruction book for this.
6. Cover pan tightly. This prevents loss of moisture and heat and cuts the cooking time and the amount of electricity used. Loose and bent covers may let enough steam escape to cause sticking or even burning. Put a double layer of waxed paper or foil under the lid to tighten it, or substitute a pie pan or another lid. If the bottom of the pan is dented in addition to the lid being loose, you might consider getting a new utensil. See "Utensils - straightening bottoms," p 47.
7. Set time signal for 5 minutes. Wind mechanical type of time signal by turning time signal hand up to 20 minutes, or at least past 10 minutes, then back.

Turn time signal to 5 minutes, or whatever time experience shows is required to bring the amount of food and water you are cooking to steaming. Remember that a small amount of water evaporates rapidly. The ringing of the time signal or of an alarm will remind you that you have something on High. If there is no time signal on the range, notice the clock. Or use one of the small "hourglass" egg timers, turning it.

8. Turn switch to lowest heat which will maintain steaming for size pan and amount of food. If you have medium weight pans with tight lids, this is apt to be a lower switch speed than you might expect. On Low heat, the temperature stays at boiling, but there is no violent action to spoil the shape of food, lose vitamins or minerals, or boil away moisture and cause sticking. Simmer continues steaming on some range units.

9. Reset the time signal. Plan to cook fruits or vegetables until tender, but still firm. Overcooking destroys vitamins, spoils shape and texture and dulls attractive color. In some foods it develops strong flavors and odors. Timing is the sure way to cook food just right. It is the secret of getting good results with small amounts of water on leafy, green vegetables and also on strong ones, as well as with the root vegetables.
10. Turn switch to Off. After thoroughly heated, Off* will keep food steaming for about 10 minutes in good utensils, possibly longer, especially on the large unit. Try experimenting with this cooking with stored heat. Heavier units (larger mass) holds heat longer than lighter weight ones. This is also true of heavier pans; however, medium weight is heavy enough. Do not peek to see how food is cooking with stored or Low heat for you will lose steam and heat needed for cooking. If you are cooking several vegetables at one time in the same pan, do not turn to Off unless you wish flavors to mix. Circulating live steam is necessary to keep flavors from mixing, so keep the food on one of the lower heats until the end of the cooking time.
11. Drain and save water. Cool and store liquid drained off vegetables in refrigerator for future use in gravy, sauce or soup. Fruit juices are usually served with fruit; if not, store for use in fruit drinks. When you add little or no water you can usually omit this step, which will save you time and bother. Just serve the liquid with the solid food.
12. Season and serve promptly. To avoid stirring, sprinkle salt over surface of vegetables in pan, turn into serving dish and sprinkle with salt again. Adding salt to vegetables here instead of with water earlier saves a little calcium and vitamin C. Letting food stand after cooking tends to overcook it, causes it to cool and exposes it longer to air, heat and water. This causes greater loss of food value, attractiveness in appearance, taste and texture. Serve promptly.

Factors affecting cooking time:

The cooking time for vegetables depends upon the following:

- Temperature of food, water, unit
- Age of vegetable and whether dried
- Size of pieces
- Amount of vegetable
- Amount of water added
- Altitude or pressure

*Instructions of many manufacturers suggest Low for finishing cooking quantities of food and Warm or Simmer (or lowest heat) for smaller amounts. Doing this is economical enough, saving of steps and very satisfactory, especially for light weight units and types of utensils found in most homes. See "Using Stored Heat," pp 71 and 72.

Young, tender, smaller vegetables cook more quickly than older ones. Smaller, thinner pieces cook more quickly than larger ones or whole vegetables. But there is also more surface exposed. If food is cooked overlong, this may increase destructive action on vitamins and minerals by oxygen in the air and loss through contact with water which is too often thrown away. The quantity of vegetables and water heated affect the cooking time, the greater mass requiring the longer time. Foods require a longer cooking time at high altitude than at sea level--the less the pressure, the lower the boiling point. Increasing the pressure in a pressure saucepan shortens the cooking time.

Adding butter, margarine, cooking, oil, bacon fat, or other bits of fat to vegetables before they are cooked, lessens the amount of water required to prevent food sticking to the bottom of the pan.

Indeed, enough water clings to many vegetables in rinsing so that no water needs to be added. Greens retain enough moisture so that they cook satisfactorily without adding either fat or water. The less water used the shorter the cooking time.

Instead of cooking food in a small amount of fat and 2 tablespoons of cold water, any of three other ways of adding the water, (described below) might be used. With these methods, season food just before serving.

Hot-start method:

Put $\frac{1}{4}$ to $\frac{1}{2}$ cup of water in the pan, or $\frac{1}{4}$ to $\frac{1}{2}$ inch or just enough to cover the bottom of the pan. Cover the pan and place it on the unit, turning switch to High so the water will come to steaming while you are finishing the preparation of the food. When steam starts escaping, add the food and cover quickly. This will cool the water slightly, but on High, steaming will start again very soon. When steam is escaping freely, turn the switch to a position of lower heat.

One disadvantage of this method is that electricity is often wasted by needless steaming. Sometimes so much water is lost that more water must be added and the temperature raised to boiling again before adding the food. You can avoid this by having the food ready before heating the water, but then you may let the food stand overlong with exposure to air, destroying vitamins. Also, undoubtedly you will take some extra steps using this method. However, it shortens the cooking time and saves vitamins, so it is a good method to use, especially if you are good at planning to have things come out even. This is the method most often recommended for cooking frozen foods. See "Home Freezing of Fruits and Vegetables," from BHNHE, USDA, Washington 25, D. C.

Or, put the food in the pan, add $\frac{1}{4}$ to $\frac{1}{2}$ cup hot water, pouring it down one side directly to the bottom of the pan, put the pan on the unit and turn switch to High. This water will steam very rapidly. To save steps when cooking several foods, you might have a container with hot water at the range and measure from it into the pans being used.

Cold start method:

Pour $\frac{1}{4}$ to $\frac{1}{2}$ cup of water in the pan, or $\frac{1}{8}$ to $\frac{1}{4}$ inch or just enough to cover the bottom of the pan. This may be either hot or cold water. Add the food, and if you wish, the salt, to this water. Then place on the unit and turn to High until steaming. If a small amount of water is used, it heats very rapidly to steaming, and heat is soon turned down to Low. This is the easiest method to use. It starts the food cooking rapidly but not quite so rapidly as the above two methods. Therefore, it is probably slightly more wasteful of vitamins, for some of the food stands for a while in the water before starting to cook.

Some women become discouraged trying to learn to use small amounts of water for cooking because the food sometimes sticks or burns. This is usually because they forget to watch for the steaming and do not turn the switch from High to Low or Simmer at this time. Therefore, setting a time reminder or alarm clock to ring, or even using an inexpensive hour-glass type of egg timer will serve as a reminder to turn the switch and will prevent overheating on High.

Poorly fitting lids may let too much steam escape. If a better fitting lid can be obtained or a new utensil bought, this can be corrected. (See point 6 for other ideas.) Otherwise, increase the amount of water used, trying $\frac{1}{2}$ cup first, then 1 cup. Very old or tough vegetables and fruit which has dried somewhat may absorb a lot of moisture. It is well to add a little extra water if food seems to be somewhat dried, old, or tough. The cooking time required will be longer, and it will possibly take slightly more water than for young, moist, tender food. However, with good covers, $\frac{1}{2}$ cup should be the most water you will ever need, except for dried foods.

Frozen foods - fruits and vegetables:

Cook frozen foods without thawing, starting them in a hot pan containing fat or a small amount of boiling water. They take less time to cook than fresh fruits or vegetables, therefore they overcook easily. Time carefully.

1. Choose the proper utensil. See 1 under "Fresh vegetables or fruits." Try a 3-quart utensil for two 1-pound packages.

2. Add $\frac{1}{4}$ to $\frac{1}{2}$ cup water to pan, or $\frac{1}{8}$ to $\frac{1}{4}$ inch in bottom of pan. Or add 2 tablespoons of fat and no water, or 1 or 2 tablespoons of water, lemon juice or vinegar.
3. Add 1 teaspoon salt, or amount required for food being cooked. Add to water here, if salt is used during cooking. If fat only is used for cooking, sprinkle salt over food. Salt causes a slight loss (about four percent) of vitamin C when added here. Salt can be added at end of cooking period and should be added there.
4. Cover pan tightly.
5. Put pan on unit to be used. See 1 and 4 under "Fresh vegetables or fruits."
6. Turn switch to High. See 5 under "Fresh vegetables or fruits."
7. When steaming, add food. Do not remove from package or thaw until ready to put in pan. Return cover to pan after adding food. Breaking the food apart*into quarters hastens thawing in the steam. Exceptions: Thaw corn on cob completely; partially thaw greens, asparagus and broccoli.
8. Leave on High until steaming vigorously. The addition of cold food will check steaming somewhat, but High heat will restore it quickly. Steaming should continue long enough on High to separate frozen food.
9. Turn to Low to finish. Use switch position which will maintain steaming.
10. Set time signal for brief cooking. Since frozen vegetables have already been heated in preparation for freezing, they require little cooking. Cell structure is softened by freezing, therefore fruit and vegetables both cook quickly. Most of them take 5 to 7 minutes after steaming with the exception of beans, which may take 7 to 15 minutes.
11. Turn switch to off. Since food is very cold and cooking time is short, stored heat is rarely used with frozen foods. If the food must stand briefly before serving for some unforeseen reason, the unit may be turned to Off before the timing period is ended. Or let stand on lowest heat.
12. Drain and save water. See 11 under "Fresh vegetables or fruits."
13. Season and serve promptly. See 11 under "Fresh vegetables or fruits."

*Banging a package of frozen peas or lima beans sharply on a flat surface breaks the frozen mass and helps speed the cooking start.

Canned vegetables:

Cook canned vegetables in their own juices. If there is little juice, as in the case of vacuum packed corn, the butter or margarine used for seasoning can be put in the pan first to prevent sticking. Start on High and when steaming, turn to Off to finish heating through. Allow about 10 minutes for total heating time, using a covered pan.

When there is a rather large amount of liquid on the canned food, drain this from the can into a pan and cook rapidly uncovered on High until boiled down to a desirable amount, or less than $\frac{1}{4}$ inch in the pan. Add vegetables, cover and heat on High until steaming. Finish on Off. Season as required. This is an excellent way to heat large whole canned tomatoes for they retain their shape, attractiveness and food values better. Finish on Low or one of lowest heats, depending on quantity.

Another method sometimes used is to drain the liquid and save it for soup, sauces and gravy--only a small amount being used in reheating the canned food.

Dried vegetables and fruits:

Cooking time can be shortened and electricity saved by soaking dried fruits or vegetables in water before cooking. Peas and beans require 5 or 6 hours in lukewarm water; whole grain wheat and whole grain corn can soak overnight; soybeans spoil easily in soaking if held very long in a warm place. Many dehydrated vegetables and fruits require only from $\frac{1}{2}$ to 1 hour, dehydrated corn takes 2 hours, and dried greens (cabbage and spinach) and some other finely cut vegetables need no soaking. Wash food to be soaked, unless previously cleaned. After washing add water (preferably soft water for beans and peas) to cover, or about twice the amount of water that there is food. For long soaking, place in a cool location to prevent possibility of fermentation and to permit using soaking water for cooking. If the soaking water is strong, you may need to pour it off and add fresh. Use 2 to 3 times the amount of water for the food in cooking, or cover the food with water.

Place soaked dried food on unit in proper sized utensil. Cover. Turn switch to Medium (or High, if in a hurry) until steam is escaping. Turn to lower position and simmer until tender, timing according to cooking directions.

Consider using a pressure cooker or the well cooker for cooking dried fruits and vegetables which require a long cooking period. See well cooker section.

Cereals:

Bring amount of water given in recipe to boiling on High. Add salt, then add dry cereal slowly, stirring constantly until mixture begins bubbling again. Cover and cook on Simmer or lowest heat or Off, depending on quantity, cooking time and other factors. See instruction book with range and directions on cereal package.

Grains:

See "Dried vegetables and fruits" and "Cereals."

Rice:

Put 1 cup of clean rice in a 2 or preferably 3 quart pan. Add 2 cups of cold water and 1 teaspoon of salt. Cover tightly. Place on small unit and turn switch to High until steam escapes. Turn switch to Off and cook on stored heat 30 minutes. Do not remove cover until cooking time is completed. Rice will be flaky and ready to serve. On units of high mass, the total cooking time, including steaming, will be 30 minutes; on light-weight tubular units, allow 30 minutes after turning unit off. Or turn switch to Simmer or lowest heat when steaming, and cook 25 minutes longer on this lowest heat.

Still another method is to use Medium for the entire time, allowing 50 to 60 minutes. This method can be used with ordinary white rice or on special occasion.. It may cause unnecessary vitamin loss with specially treated or brown rice.

OTHER SURFACE UNIT COOKING OPERATIONS

Baking on surface units

Sometimes you will see a recipe for baking on surface units. The even controlled heat of an electric range unit makes baking possible in a medium or heavy gauge aluminum utensil, which conducts heat evenly. Instructions for this baking are rarely found in range instruction books, but sometimes come with surface cooking utensils. Follow directions. Use Low to Medium switch setting depending on temperature needed.

Blanching or scalding

1. Put pan on unit, choosing a large pan which has room for a wire draining basket and also has a tightly fitting cover.
2. Follow directions for amount of water. To scald in boiling water for freezing use plenty to cover - 1 gallon or more for 1 pound of vegetables. To steam scald, as for broccoli, use 1 or 2 inches of water in pan and a rack or trivet $1\frac{1}{2}$ to 2 inches higher.
3. Keep unit on High throughout scalding. Time accurately.
4. Turn unit Off when through. Or replace evaporated water and scald another load of food.
5. Remove food and cool rapidly for freezing. If food is being canned, pack hot in hot clean or sterilized jars as directed.

Boiling

1. Put pan on unit, choosing a pan which can be covered tightly.
2. Turn switch to High and leave there until steam escapes freely.
3. Add food as directed, either when pan is put on unit (as with soup stock) or when water is boiling. Leave on High until steam escapes again if adding food here.
4. Turn switch to lowest setting which will maintain boiling. Try Low. Remember that slow boiling cooks as fast as rapid boiling, and that it is less likely to cause boiling over or boiling dry and burning. Slow boiling keeps food whole and saves vitamins, minerals and money for electricity.

Braising or fricassoeing meat

1. Put pan on unit, choosing a pan which can be covered.
2. Turn switch to High, if in a hurry. Or start to fry on one of the medium heats.
3. When hot (test by touching side with a damp finger or by a water drop's dancing) add two tablespoons of fat or enough to coat bottom of utensil. Or put pan and fat on unit at same time in step 1. Never let fat get hot enough to smoke.

4. Add meat and brown in fat. Season and flour if wished in advance.
5. Turn switch to Medium heat to finish browning.
6. Add a small amount of additional liquid (vegetable juice, water, milk, cream, stock to fricassee) or cook in own juice (braising).
7. Cover pan tightly. Leave switch on Medium, or turn to High if liquid has been added.
8. When steaming, turn switch to lower heat, either Low or Simmer, or lowest heat. This heat can be used to finish cooking.
9. Time the cooking. Set time signal, if there is one.
10. When done or nearly done turn switch Off. See pp 71 and 72.
Remove food.

Butter - melting See "Melting chocolate, table fat."

Canning

Most of the newer ranges have unit tubes raised high enough to give protection to porcelain enamel when used with larger utensils, such as those used in canning.

In some cases, and especially on older ranges, it is desirable to raise units above cooking top when using many pressure canners or water bath canners, for the heat from very large overhanging utensils, especially those with recessed bottoms, may permanently discolor and even damage the porcelain finish by causing it to craze or check. To raise a large utensil, use one of the following methods:

- Metal canner ring provided with the range, if there is one.
- Pieces of metal or strap iron strips under the metal ring.
- Asbestos shingle cut in 2x2-inch pieces over enamel and under ring.

To eliminate any possibility of trapping heat, raising the unit with asbestos shingle cut in pieces two-inches wide is considered preferable to the recommendation sometimes given to put 1/8-inch asbestos over the enamel and under the ring all around the unit.

Canning - with steam pressure cooker or canner

The steam pressure cooker or canner is recommended for processing all meats and all low acid foods which you want to keep by canning.

1. Put water in pressure canner - 2 or 3 inches in bottom.
2. Place pressure canner on large unit. If it overlaps onto the porcelain enamel, raise the unit and canner. See "Canning."
3. When the canner is in place, turn unit to High. Cover loosely. Bring water to boil.
4. Fill the canner with jars or cans of food prepared by directions. Cover and close, leaving petcock open or weight off. Follow pressure canner manufacturer's directions for this.

5. Leave on High while steaming to exhaust air (see directions, about 10 minutes).
6. Close canner petcock or add weight for processing. Follow manufacturer's instructions. Note time.
7. Leave unit on High while pressure rises until nearly to processing point. Test to learn when to turn down heat; try first at five pounds below pressure desired, or when weight starts to move. Keep a record of time required.
8. Turn unit to second lower switch position or whatever Medium heat will maintain pressure.
9. Adjust heat to maintain even pressure, if necessary. Experience soon will teach you what is required to maintain even pressure.
10. Time accurately as directed by time table being used.
11. At end of time, turn unit Off and remove canner. Avoid scraping enamel on cooking top with heavy canner.
12. Let pressure return to zero, and then allow canner to stand 1 or 2 minutes before opening petcock or removing weight. Follow canner operation instructions. Uncover canner, lifting lid so steam will escape away from instead of toward you.

Canning - with water bath canner

The boiling-water bath is safe and satisfactory for processing acid foods. Use a large utensil with a tight cover and a rack to fit in the bottom.

1. Prepare canner for use by putting in rack and filling to proper depth to later cover jars with hot water. Cover.
2. Place water bath canner on large unit. Raise unit and canner if necessary. See "Canning."
3. Turn switch to High. Water can be boiling for hot pack method; hot but not boiling for cold pack method.
4. Place filled, partially sealed jars on rack. Turn self-sealing type tightly shut by hand. Turn other types tightly, then back $\frac{1}{4}$ turn. On bail type, leave short wire up.
5. Add hot water if necessary to cover jars, preferably 1 or 2 inches above jar and allowing an additional 1 or 2 inches space above for brisk boiling. Cover canner.
6. Heat on High until water boils.
7. Turn switch to whatever lower heat will maintain boiling.
8. Time accurately according to directions given.
9. When time is up, turn switch to Off. Remove jars from canner and seal, unless self-sealing type.

Cheese - melting, cooking (See "Protein foods.")

Chocolate - melting See "Melting chocolate, table fat."

Coffeemaking with a vacuum coffeemaker

1. Fill lower part of bowl with measured amount of water needed.
2. Place coffeemaker on small unit, preferably a rear unit.
3. Turn switch to High. If your small unit has a center coil which heats separately, use the switch setting which will turn this on its highest heat. If not, it will be cheaper and more satisfactory for you to use an electric coffee-maker.
4. When water is boiling, put filter in upper part of bowl and fit upper bowl over lower bowl. You may do this in step 2, if wished, and add coffee then, skipping steps 4 and 5. Water will be forced into upper bowl.
5. Measure coffee into upper bowl as water starts rising.
6. Turn switch Off.
7. Stir coffee in upper bowl if wished. Avoid jarring filter.
8. Time period depending on strength of coffee wanted. Usually it takes one to three minutes.
9. Remove coffeemaker from unit and let coffee return to lower bowl. Remove upper bowl and serve coffee promptly. If desired, return lower bowl to unit and hold on lowest switch setting which will heat 4-inch center coil.

Coffeemaking with a percolator

While it is a little less expensive to percolate coffee in an electric coffeemaker than on a surface unit of the range, the range may be used for this purpose. If your range has 2-coil units with the separately heating 4-inch center coil in one of the smaller units, this is a good place to "perk" coffee.

1. Place coffeemaker with measured amounts of water and coffee in it on small unit, preferably a rear one.
2. Turn switch to position which will heat 4"-coil to highest heat.
3. When coffee starts perking, turn switch position to position which maintains lower heat on inner coil.
4. Time perking to get same results each time.
5. Turn switch to Off. Coffee will stay hot briefly on Off.

Double boiler cooking

With electric units, it is not necessary to use a double boiler. You can get the same even controlled heat by using one of the lower switch settings. Follow range manufacturer's instructions for cooking whatever you would normally prepare in the double boiler. If in a hurry, turn unit to High for a minute or two at most to start heating, then to the switch position suggested by the manufacturer of your range for food being cooked. This will usually be a Low or Medium heat.

Eggs See "Protein food" for suggestions on cooking egg dishes.

Eggs - poaching

1. Place covered pan containing enough water to cover eggs on unit.
2. Turn unit to High long enough to bring water to boil, or about 5 minutes.
3. When steam starts escaping, add eggs.
4. Turn switch to Low and cook to degree of doneness wished.
Time for accuracy.
5. Turn switch to Off. Remove eggs.

Eggs -- steaming

1. Put $\frac{1}{4}$ cup of cold water in pan with eggs.
2. Cover pan and put on unit.
3. Heat on High until steaming.
4. Turn switch to Low or Off.
5. Time accurately.

For soft eggs: turn to Off when steam escapes freely and time 3 or 4 minutes, as wished. Let stand up to 10 minutes for medium hard eggs.

For hard eggs: turn to Low after steaming and cook on Low 10 minutes, then turn to Off and let stand 15 minutes without uncovering. Or cook on Medium heat in 1 cup of water for 20 minutes.

Fruits See separate section on "Cooking Vegetables, Fruits
Grains or Cereals"

Frying in deep fat (See "Using the well cooker," pp 49-52).

1. Choose a 4 to 6 quart utensil, 8 or 9 inches in diameter.
2. Place on large unit with about 3* pounds (6 to 7 cups) or more fat in utensil. Melted fat should be at least 3 inches below upper edge of utensil; it is usually more than this.
3. Cover fat tightly. Note time, or set time signal for 5 minutes. Covering helps lower wattage cookers reach temperature.
4. Turn unit to High and heat fat to frying temperature. Watch fat to prevent overheating. Remove cover as fat becomes hot.
5. Check temperature with fat frying thermometer or 1-inch bread cube. Check closely as it approaches 350° F. (test-60 seconds to brown bread). Most fat frying temperatures are around 375° F. (40 seconds - bread test); potatoes require higher temperature, but not over 400° F. (20 seconds - bread test). Remember or record heating time.
6. Add food in small quantities. Note time required to cook.
7. Turn switch to next lower or second lower position or whatever position will maintain frying temperature. Adjust as necessary. Bring up to proper temperature before adding each fresh quantity of food to be fried. Do not let fat smoke.

*Less fat than this can be used for many processes, often $1\frac{1}{2}$ inches or about 2 pounds.

8. Drain fried food on paper (paper toweling, brown wrapping paper or other unglazed plain paper.) Add salt, if needed, while on paper. If to be served warm hold in warmer, or put in oven set at 150° F.

Frying (pan-frying, sauteing, pan broiling) in small amount of fat

1. Place skillet to fit on unit to be used. Have a flat-bottomed pan for even frying. If warped, straighten. See "Utensils," p 47.
2. Turn switch to High, for fast start - or Medium High* or Medium.
3. When hot, add 2 tablespoons fat or fat to cover bottom of utensil. Or depend on fat in meat, as in pan broiling (this usually requires more frequent turning and closer watching than frying in fat). Or fat can be added in step 1.
4. When fat is melted, add food.
5. Turn switch to next lower or second lower position or whatever heat will maintain frying without the fat smoking. Frying vegetables and grain products at too low temperature may cause grease to soak into food.
6. Turn food when brown on one side, and let brown on second side.
7. In frying meat, pour off excess fat as it forms. Remember, tender meat stays tender if cooked at low or moderate temperature. Less tender meat needs some moisture, in addition, to make it tender.
8. Turn food as necessary to finish cooking meat as done as wished. (Or cover and cook in own juice or with added moisture. See "Braising.") After browning fresh pork, add a small amount of water, cover tightly and cook until thoroughly done. This is not necessary if pork has been frozen. Freezing pork kills trichinae, which is the main reason for cooking pork thoroughly. (20 days below 5° F).

Other satisfactory ways of frying are: Heat skillet and fat on High until hot (less than 5 minutes), then add food and lower heat when first side is brown. Or start on a medium heat and continue at that switch setting throughout frying operation.

Frying bacon and eggs

1. Start bacon in cold skillet.
2. Fry on Medium heat until as done as you like it.
3. Remove bacon and drain on paper.
4. Pour most of fat from pan and return pan to unit.
5. Put eggs in pan. Season.
6. Add two tablespoons of water.
7. Cover tightly.
8. Turn switch to Off, and time for degree of doneness wished. This step usually takes 3 to 5 minutes. Or omit steps 6 and 7; and time longer.

*Using one switch setting throughout when possible saves time, steps and worry.

Flour-thickened foods

For gravy, pie filling, pudding, salad dressing, various sauces and similar flour- or starch-thickened foods, you might follow the directions below. They also apply for custard and icing.

1. Measure ingredients into pan as directed in recipe used.
2. Place pan on small unit, unless cooking a large quantity of food.
3. Turn to High for 1 minute (count to 60) to heat quickly.
4. Turn to medium or lower heat for cooking. Or start on Medium or Low (Low is preferable for custards) and finish on same or lower heat. Medium heats speed process.
5. Stir with wooden spoon; or beat with electric mixer in the case of certain icings. Higher heats can be used with more stirring.
6. Turn to Simmer or Off to keep hot, if desirable. Cover.

Grains See separate section on "Cooking Vegetables, Fruits and Grains, or Cereals"

Jelly making

1. Put not over 8 cups of juice, with sugar required added, in a large, flat, covered pan. Covering is suggested because rapid cooking is desirable. Watch carefully to avoid boilover.
2. Place on the large unit, starting on High.
3. As soon as steam begins to escape, remove cover.
4. Continue boiling rapidly, and uncovered, until jelly state is reached.

Melt paraffin used on Low. Sterilize jelly glasses, starting on High heat. (See "Sterilization.") In canning fruit juices for later use in jelly making, place juice without reheating in hot sterilized jars, partially seal, and put on rack in water bath at 185° F., or simmering. Water should cover jars 1 or 2 inches. Bring water again to simmering and time 20 minutes. Turn unit Off. Remove and seal jars.

Melting chocolate, table fat

Leave square of chocolate in paper wrapper just as it comes wrapped when removed from larger package. Place on small unit in wrapper without any unfolding of the wrapper. Have folded side upward to prevent leakage when melted. Turn unit to Simmer or lowest heat. Chocolate melts inside paper. If less than a square is needed, the amount wanted can be chipped onto foil or parchment paper*. Use spatula to scrape off when melted. Melting chocolate on paper or foil directly on unit saves washing a pan.

Melt table fat on Low or Simmer position. If melting a small quantity, use the lowest heat which heats the 4-inch inner coil of a small unit if your range units have these separate-heating center coils.

*Using waxed paper may cause slight smoking of unit later. Put paper in pan.

One-dish meals

You can prepare a large variety of one-dish meals on the surface of the electric range. You will probably cook most of these in a skillet or in the well cooker. Or possibly you will use some other deep medium-weight pan. Normally these meals consist of a meat with vegetables. Or they may be meat cooked with a starchy food such as dumplings, rice, macaroni or spaghetti, and possibly a vegetable like tomatoes. In the case of a meal prepared in the well cooker or in a large pan on a surface unit, there is also often a dessert included or sometimes a steamed bread.

Here are steps which you might follow:

1. Place large pan on unit, usually the larger one, or use the well cooker.
2. Turn switch to High.
3. Add two tablespoons of fat, or enough fat to cover bottom of pan.
4. Brown meat quickly on one side, adding it when fat melts and is hot.
5. Turn and brown meat on other side on a lower heat and to a lesser degree of brownness. This is desirable because in further cooking, even though there is moisture present, the meat will tend to brown a little more if it lies directly on the bottom of the pan.
6. Add other ingredients as directed. If an uncooked starchy food such as rice or spaghetti is added dry, put it in pan, then add tomatoes or whatever liquid is used. Otherwise, the dry starchy food may not cook thoroughly.
7. Turn unit to High until steam escapes.
8. Reduce heat by turning switch to one of two lowest settings. Many foods will finish cooking after steaming vigorously without using any more electricity. Do not peek, however, and do not use this Off setting for finishing cooking if you wish to have flavors separate and distinct from each other. Keep on Low so that steam will continue to circulate. When it starts to condense, flavors mix.

Pancakes

1. Place griddle or skillet on unit. Use large unit.
2. Turn switch to High, or Medium High heat. See Frying.
3. When pan is hot, add 1 tablespoon fat, unless using seasoned griddle and high-fat content in recipe, and even then a little fat is usually necessary. Check pan heat by dropping a drop of water. If it dances about in pan, pan is ready.
4. Drop pancakes onto hot griddle using tablespoon or gravy ladle. Or Pour from pitcher.
5. Cook on one side until full of bubbles.
5. Turn switch to a Medium heat to maintain even temperature and to prevent smoking. Low may be a better heat.
7. Turn and cook pancakes on other side.

Popping Corn

Popcorn is a favorite with farm families nearly everywhere. Use skillet on large surface unit or pop corn in well cooker. A 3-quart utensil works well on small unit for smaller quantities.

1. Put utensil to be used on unit and turn switch to High.
2. When hot add two to four tablespoons of fat or enough to cover bottom of utensil. Let fat melt, but do not let it smoke. Avoid overheating a thin utensil and warping it.
3. Add measured amount of popcorn and salt. Stir thoroughly. Try $\frac{1}{2}$ cup corn and $\frac{1}{4}$ cup fat in 4-quart pan or well cooker.
4. When popping starts, cover utensil. Reduce heat to Medium or Low.
5. Shake utensil gently occasionally. Do not raise cover.
6. When decrease in popping noise indicates popping is nearly finished, turn switch to Off. Uncover. Season.
7. Turn out into serving dish, and hold in warmer.

Pressure cooking See "Canning - with steam pressure cooker or canner"

1. Start on High. Note starting time. For pressure cooker or canner let steam escape 7 to 10 minutes or as directed by manufacturer's directions, then close vent. Follow pressure saucepan manufacturer's directions for filling and closing saucepan, use $\frac{1}{4}$ cup water for most cooking (under 10 minutes); $\frac{1}{4}$ - $\frac{1}{2}$ cup up to 20 minutes; 2 cups for steam puddings and breads; 4 cups for canning; let steam escape 1 minute before adding weight, or exhaust valve type with or without a little pressure (exhaust without pressure for rice, applesauce, thick foods).
2. Turn switch to lower heat position (try Medium for heavy canners, Low for saucepans) before pressure is reached to avoid over-shooting (not necessary with very light weight range units which respond quickly to control). If the pan has a gauge, reduce pressure when about five pounds less than desired pressure. If it has a weight, turn down heat when weight starts to move. Note time required so that you can repeat the time again. Turn Off instead of to lower heat position if cooking time is only 1, 2 or 3 minutes (exception - light weight units).
3. Time properly. Follow pressure cooker or saucepan manufacturer's directions or some reliable instructions for timing food. A longer time (about 20 minutes more for pint jars) is required to can in pressure saucepan than in pressure cooker.
4. At end of time, remove saucepan and cool rapidly to zero as directed (usually with cold running water except for meats, cereals and canning). Do not cool a pressure canner with water. Run water on sides of self-closure type of pressure saucepan. Uncover, opening cover away from you.

Protein foods - milk, cheese and egg dishes Also see "Braising and fricasseeing meat," and section on "Frying."

These three proteins--milk, cheese and eggs--like meat, should cook at low temperatures. Concentrated protein foods from animal sources tend to toughen at high temperatures or when over-cooked. Milk, which does not coagulate and toughen unless sour, coagulates when heated with acid, very salty food, or some vegetables (asparagus, carrots, peas, string beans).

Cheese dishes:

1. Cut cheese very fine. Thinly shaved or finely grated or diced cheese melts quickly.
2. Turn unit to Low heat.
3. Add cheese at last. Cheese should be added to other foods at the end of the cooking period. Overheating causes it to become tough and stringy or ropy.
4. Replace cover. The heat in the food will usually melt the cheese if the food is covered.
5. Let food stand on unit. The stored or low heat, used at the end of the cooking period in cooking most foods, will not overcook cheese.
6. Stir food before serving. If cheese is to be mixed through the food, stir it, crushing any larger lumps which may not have melted.
7. Serve immediately, or refrigerate. Serve while hot, store extra supply in refrigerator promptly, chilling in cold or ice water or putting away hot.

Milk dishes:

1. Put food in metal pan, cover and place on unit. Whenever possible, milk dishes should cook in a covered metal pan; the cover keeps out light which destroys riboflavin (vitamin B₂). Covering, along with low heat, also helps prevent the formation of a "skin" on top of the milk.
2. Cook on Medium or Low heat. This prevents sticking, curdling or scorching. Use fast brief heating for acid and milk mixtures.
3. Stir as necessary, using wooden spoon.
4. Finish cooking on Simmer or Off. Keep warm on same settings.
5. Serve soon; or refrigerate. Milk combinations, especially dishes with eggs and milk, should be cooled in cold or ice water and refrigerated promptly if not used immediately. If there is not time to cool, put in refrigerator while hot.

Scalding milk

Pour milk into lightproof utensil. Cover tightly. Place utensil containing milk on unit. Turn to High for 1 minute (time or count to 60). Turn to Low and heat to scalding temperature, or to just below boiling.

Small Utensils

Many range units have a place for small pans. This is a center coil which will heat separately. It is usually about four inches across. Study your instruction book or experiment with switch positions, feeling unit to learn whether your range has such a "4"-coil. What switch position gives High heat on this spot? What switch position gives Low heat? Is the switch setting the same for inner coil in the small unit as for that in the large one?

Learn these switch positions, especially for the small units at front and back. It will be useful and economical to learn how to operate the hotspot for heating food in small pans and making coffee.

Sterilization

Use well cooker, canner or any container large enough for job.

1. Put rack in bottom of a container large enough to hold water covering objects being sterilized and still allow 1 or 2 inches at top for vigorous boiling.
2. Put water in container.
3. Fill any jars to be sterilized with water and holding your hand over the mouth invert them on rack.
4. Cover container after adding enough water to be sure all objects to be sterilized are covered.
5. Turn unit to High and leave on High until boiling vigorously.
6. Turn down to the lowest heat that will maintain boiling, usually Low.
7. Time sterilization. Allow about 15 or 20 minutes total boiling time.
8. Turn switch to Off and leave container on unit to keep jars or jelly glasses hot if to be used in canning. If not, pour off water and leave inverted on rack in covered container until needed. (Example - baby bottles.)

Stewing

1. For brown color, richer flavor and slightly thickened juice, season meat and coat with flour by shaking meat pieces with flour in paper bag. Or sprinkle with flour. Then brown in stewing pan. (See "Frying.")
2. Add amount of water wished--usually nearly to cover, or covering.
3. Bring to steaming on High.
4. Turn to Simmer or lowest heat and cook until nearly tender.
5. Add vegetables.
6. Return switch setting to High until steaming, then turn to Low and cook vegetables until tender but firm.

Utensils - straightening bottoms

1. Put any all-metal utensil with a warped bottom on unit. Clean very thoroughly beforehand.
2. Turn unit to a Medium heat and heat slowly for 10 minutes. Watch carefully. Aluminum will melt on higher heats if forgotten and left on unit dry.
3. Turn upside down, place flat wooden piece over utensil and hammer straight. If warped upward toward center and inside of pan, put small wooden piece inside and pound downward against flat surface. If not straightened, repeat steps, getting utensil hotter.

Note: To prevent warping, avoid overheating or sudden temperature change, such as pouring cold liquid in very hot pan.

Vegetables See separate section on "Cooking Vegetables, Fruits and Grains or Cereals"

Warming food

Reheat thickened foods and protein foods on Low heat. Pour liquid off of other foods into utensil, place utensil on High heat. When steaming, add solid portion of food and heat rapidly to steaming again; then turn heat lower.

Keep or hold food already heated warm on Warm or Simmer or lowest heat. Or stack pan on top of another pan which is still cooking. You can do this if your pans have flat covers with recessed knobs.

USING THE WELL COOKER

Uses: The well cooker is primarily designed for long, slow cooking processes and for quantity cookery. It can be used for boiling, deep-fat frying, steaming and, when equipped with a baking rack, for baking small quantities of food. On some ranges, a cooker unit can be raised to become a surface unit. Also on some a well cooker can be converted to a pressure cooker.

Nearly all of the operations performed on surface cooking units can be performed in the well cooker, especially if it has a pressure lid in addition to its regular lid. Of course, frying eggs and pancakes and some other operations are surface cooking processes performed more conveniently in shallower utensils. In general, any cookery requiring close attention or manipulation of the food is more conveniently done if one of the front units is used rather than a rear well cooker. Some uses for which the well cooker is suitable are:

1. Baking beans and cooking other dried fruits and vegetables.
2. Baking casserole dishes, apples, potatoes, squash and some other foods on the baking rack instead of in the utensil.
3. Cereal cookery and starch cookery (spaghetti, etc.).
4. Cocoa and coffee in large quantity.
5. Complete surface meals of meat, vegetables and dessert.
6. Fruit butter, jelly, marmalade and sauces.
7. Frying in deep fat.
8. Meat cookery -- long slow cooking of less tender cuts.
9. Pasteurizing milk.
10. Popping corn.
11. Reheating rolls, biscuits, infant's foods, several left-over foods
12. Sea-food -- lobster; quantity cooking of shrimp, clams, oysters.
13. Soup, meat stock.
14. Steaming brown bread, other breads, puddings, desserts.
15. Sterilizing jelly glasses, jars, baby bottles, jar lids.
16. Stews, chili.
17. Vegetable cookery -- spinach, other greens; mixed vegetables; quantity cookery of vegetables; large vegetables, such as corn on the cob, stuffed cabbage.

Advantages: The well cooker provides a large cooking container out of the way below the surface of the cooking top and usually at the back of the range. It is suitable for long, slow cooking and for most normal surface cooking processes. The utensil holding the food is below the cooking top of the range, and its lid is often level with the table top. Such a lid sometimes serves as an extra working area even while the cooker is in operation. Because the well cooker is low, you can look into the pan and add food to it from a nearby work area more easily than if the pan were on a surface unit. However, it is more difficult to take the utensil in and out of the well than to move it off of a regular unit.

Well Cooker operation: Most meats used in cooker meals need browning first to be attractive. The newer high-wattage well cooker units brown meat quickly. With a low-wattage, slower cooker it may sometimes be desirable to brown the meat which is to be a part of the well cooker meal outside of the well. Use either the cooker utensil or a skillet on one of the surface units. Brown one side well, the second and lower side lightly, since this side continues to cook and brown until removed from unit. Avoid warping by overheating, cold liquid.

The meat chosen for a well cooker meal allows more room for vegetables and dessert above it, if it is a round flat piece with little bone which fits into the bottom of the cooker. It also cooks in less time than a chunky piece. Sometimes a steamed bread or pudding can go in the bottom alongside a chunky piece of meat, and vegetables can go on top. Otherwise both vegetables and bread, or dessert, go above the meat.

The general procedure for using the cooker:

1. Start frying, boiling or steaming on High. Use only small amounts of water, except for cereal, dried foods, soups, stews and similar foods. This means $\frac{1}{4}$ to $\frac{1}{2}$ cup, never over 1 cup, for most cooking.
2. Finish cooking on Low.
3. If cold food or additional liquid is added during cooking, turn to High until steaming again, then reduce to Low.
4. When several foods are being cooked together, leave on Low throughout cooking to prevent flavors mingling. Avoid using much water.
5. Cover desserts and breads with waxed paper, foil or a tight cover. Hold waxed paper in place with string or a rubber band. Or follow 3, 4, 5, 6 closely and don't cover.
6. Remove food as promptly as possible from the cooker. This prevents staining which is difficult to remove. It also helps prevent pitting of aluminum sometimes resulting in holes which will have to be repaired.

Fresh vegetables are cooked more quickly if the switch is turned to High and if steaming is vigorous when vegetables are added. Add vegetables quickly, then cover. Keep on High until steaming again, then turn to Low.

Dried fruits and vegetables can be cooked without soaking if wished, starting them on Low or cooking on Simmer overnight. However, soaking first is preferable.

For dessert, bread or small fruit cake, use the pudding pan which comes with the well cooker or try a metal coffee can, a #2 can with smoothly cut edges, a mold or a deep glass dish. Large baking powder cans are excellent for brown bread, date bread and similar steamed breads. The lids of coffee or baking powder cans serve as covers for these containers. Grease containers well on the inside, fill about $\frac{2}{3}$ full.

id. Deep-fat frying: See "Surface Unit Cooking Operation" for directions. On newer high-wattage well cookers, frying in deep fat is simple and satisfactory. In low-wattage well cookers it is desirable to heat the fat on a surface unit and generally to fry on the same unit. However, it would be wise to try placing the utensil full of fat in the well to see if the unit will maintain the proper frying temperature. Frying in the well cooker is convenient.

Reheating breads*: Sprinkle moisture on bottom of well cooker utensil. Place rolls, biscuits or bread on trivet, sprinkle utensil sides and bread with a few drops of water and turn switch to High. Avoid burning or overheating. More time on Medium lessens chance of warping utensil.

Reheating other food: Put $\frac{1}{4}$ - $\frac{1}{2}$ cup water in cooker, or use $\frac{1}{2}$ to 1 cup for a large quantity of food. Put trivet on ledge and place food on it. Turn switch to High until steaming, then to Medium or Low depending on amount and coldness of food, its thickness, and haste.

Amount of water: Below is a brief summary guide on amounts of water to use for common well cooking operations.

- Baking -- use baking rack, no utensil, no water.
- Beans -- for dried beans 3 times as much water as beans.
- Breads -- 1 cup for steaming; sprinkling to reheat.
- Greens -- no water; enough clings to them.
- Meal -- $\frac{1}{4}$ to $\frac{1}{2}$ cup water, unless a stew - then cover meat.
- Meats -- $\frac{1}{4}$ to $\frac{1}{2}$ cup for fresh meats.
1 to 2 cups for cured meats.
- Cover with water for soup, stews, very salty meat.
- Sterilization -- cover objects with water.
- Triplicate pans -- 1 cup in well cooker utensil.
- Vegetables -- see greens and dried vegetables.
 $\frac{1}{4}$ to $\frac{1}{2}$ cup for other vegetables.
Or 2 T fat and 2 T water or lemon juice.

BUILT-IN GRIDDLE

Uses: Frying, dish warming, cooking food in pans. Covered, it is a work space. Cover is useful as a tray and as a backsplash.

Operation:

1. Wash and dry.
2. Season by greasing with unsalted fat and heating until fat is melted.
3. Cool.
4. Wipe off fat.
5. Preheat before using.
6. Grease lightly for foods that might stick.

*If a baking rack comes with the cooker, remove utensil and use it. Put rolls in foil, or in paper bag, sprinkling with water. Use Medium heat; turn once if in hurry.

OVEN MEALS

Oven Meals - Advantages. Here are some of the advantages which homemakers can enjoy by cooking all of the food in a meal in the oven at one time.

Free time for lots of other things comes with using the oven to prepare whole meals. There can be time to work in the garden, time to carry on a profitable side-line enterprise--to attend extension and other club or community meetings, or visit the neighbors--or to rest, read or enjoy a hobby--or to play with the children. Or there can be time to help with cooperative and community enterprises which take place away from home in the afternoon. If company is invited for a meal, there is time to visit with the guests. And an oven meal is a natural for Sunday dinner, for shopping days, or for days to be spent outdoors.

The time which can be saved by oven meals depends on what you know about oven meals, your ability to plan, and on having good food combinations and good recipes for the meals. In meals which are put in the oven long ahead of cooking, the temperature in the kitchen is a factor too. Food spoils rapidly outside of the refrigerator if a room is warm. Refrigerated food in cold pans, especially if it is in large pieces, stays cold a long time in an insulated oven. For most things, use a figure of not over two hours' standing as a guide.

Cooking several foods in the oven at once saves electricity, therefore, money. And it saves time compared with cooking food both on the surface of the range and in the oven. However, surface cooking of meals is cheaper generally than cooking in the oven. When guests are expected, or even for home folks, you can do a lot of advance preparation for oven meals. Put the food in the utensils it is to be cooked in and store these in the refrigerator until ready to put the food in the oven. Even breads and cakes can be made and held in the refrigerator until ready to put in the oven. But don't forget that advance cutting of vegetables and fruits increases vitamin losses, also that cold food requires a longer time to cook.

Stored heat can be used for the latter part of the cooking period. At least 15 minutes before the end of the cooking time, turn off the oven. If the automatic timer is being used, this is quite simple to do. Set the timer when you put the food in and it takes care of remembering for you. If you do not have a timer, set an alarm clock or time signal. However, current savings are not large, and flavors may transfer.

Types of Oven Meals: There are three main types of oven meals.

1. Long-holding type (three to eight hours out of kitchen): Frozen meats or a thoroughly chilled roast, ham, or a whole chicken can wait longer than smaller cuts of meat or ground meat dishes. Since milk and eggs spoil readily, dishes containing these foods should be omitted from long-holding meals. Avoid foods that discolor on

standing or coat them with lemon juice. Choose foods which cook at the same temperature and in the same length of time. This type of meal is especially suited for automatic timing.

2. Short-holding type (one to three hours out of kitchen): Smaller pieces of meat, meat loaves*, slices of meat and more perishable foods can be used in this type of meal. Choose foods which cook at the same temperature and in the same length of time. This type of meal is especially suited for automatic timing.
3. Interruptive Meal: The foods used in this type of meal can be put into the oven at different times, and even the temperature for them can sometimes be changed. The base of this type of oven meal is usually a large piece of meat. The foods taking a shorter time can be cooked during the first part or the last part of the cooking period. While some oven foods are being dished, a high-temperature food, such as biscuits, ~~can be baked in a~~ higher temperature oven. Just reset the thermostat dial as you start removing food, using preheat for a fast start. Turn to bake after you add the biscuits. Use bake only in high-wattage ovens.

Planning the Oven Meal. Start to plan the meal by deciding on the meat or meat-substitute which is to be the main dish. What is the temperature at which this food should be cooked? How long should it be cooked?

Having decided on the cooking time and temperature of the main dish, choose vegetables and a dessert which will fit with this time and temperature, or vary the temperature slightly (25° to 50° F.) to reach a compromise temperature. If you will be there during the cooking, you can select some foods which can be added about halfway through the cooking time of the oven meal. Here are some guides:

Vegetables which are suitable for oven meals include: beets, carrots, corn, onions, parsnips, potatoes (both white and sweet potatoes), turnips, squash. Green vegetables retain their vitamins and color better if cooked rapidly on the surface of the range. Therefore, green leafy vegetables, and most strong-flavored vegetables, are almost "musts" for surface cooking. If frozen, add butter or cream, cover; cook not over 1 hour.

Desserts: Baked and dried fruits, steamed puddings (plain, fresh or dried fruit types, mincemeat), fruit breads and fruit cakes are all suitable for long-time meals. For short-time meals, use butter cakes, fruit cobblers, gingerbread, upside-down cakes, pies. The volume of the less delicate cakes will be satisfactory when they are baked with oven meals started in a cold oven, though some other factors, including texture, will be slightly improved with a hot start.

*Ground meat deteriorates rapidly. Avoid holding outside of refrigerator. A thoroughly chilled meat loaf might stand up to two-hours in the oven before starting to cook.

<u>Time</u>	<u>Meat or Main Dish</u>	<u>Vegetables</u>	<u>Dessert</u>
Long 2-3 hours	Large roast, ham, whole chicken, pot roasts, stews, partly-thawed meat.	Squash, larger whole root veg's., dried beans or peas, hominy.	Steamed pudding, dried fruits, brown bread, fruit cakes.
Medium 1-1½ hours	Meat loaf, small roast (rare), 2-in. ham slice, chops, pieces of chicken.	Carrots, corn, lima beans, beets, rice, onions, potatoes, whole tomatoes.	Baked fruit, stewed fruit, puddings, cobblers, refrigerated cakes.
Short ½-1 hours	Fish, thin ham slice, sausage, left-over meats, scalloped dishes, egg and cheese dishes.	Fish, thin ham slice, sausage, left-over meats, scalloped dishes, egg and cheese dishes. (oven-fried; cooked)	Pies, ginger-bread, some loaf cakes, bread-type desserts, rolls, quick breads.

Preparing Food for Oven Meals. Place tender meats fat side up in a shallow, uncovered pan. Do not baste or use water. Tougher cuts cook better covered and with a small amount of water added. Follow recipes for time and temperature.

Cook vegetables in tightly covered pan, using a small amount ($\frac{1}{4}$ - $\frac{1}{2}$ cup or $\frac{1}{4}$ inch) of water, preferably hot. If you salt vegetables before cooking, add the salt to the water. Salt causes a slight loss (about four percent) of Vitamin C. Loosely covered pans let too much steam escape into the oven, slowing the browning of roasts and desserts. Also frequently the vegetables themselves dry and scorch. To bake, put foods containing little moisture directly on upper oven shelf or in shallow pan. In a full oven, you can stand baking potatoes on end around the meat in the roasting pan. You can also stack covered pans.

A lot of moisture in the oven produces unnecessary moisture and heat in the kitchen, sometimes resulting in steaming, condensation and staining around vent and doors. In addition, too high temperature will cause this.

Fruits cook well in the oven. Use a tightly covered pan and little water for stewing, an open pan for baking. Dried fruits require plenty of water--enough to cover them. They will steam less with low-temperature meals and in tightly covered pans.

Timing varies somewhat in cooking of vegetables, depending on the way they are cut, the utensil, and the temperature of the oven:

<u>Type Meal</u>	<u>Hours</u>	<u>Method of Cutting Vegetables, Green Fruit.</u>
Long-time	2-3	Leave whole. (Cover; use shiny pans.) Large sized fruits and vegetables are better.
Medium-time	1-1½	Quarter or half. Leave whole if small. Whole potatoes and apples bake in this time.
Short-time	½-1	Small cubes, strips, thin slices, shredded, grated, or ground. Quarters, sixths, or eights. Small whole foods bake in this time.

It must be remembered that vitamin loss is least when there is the least exposure to air, water, and heat. In the oven, vegetables require about three times as long to cook as on the surface. The cooking time can be varied by size of pieces, smaller pieces cooking in less time but also having more area exposed to water and air. The type of pan influences this too, shiny pans slowing the cooking time as compared with enamel ware or glass. Higher temperatures start cooking more rapidly.

Arranging Food in the Oven. The meat, uncovered unless tender cut, and vegetables in a covered pan are put on the bottom shelf. Desserts, breads and baking potatoes go on the top shelf. Desserts and breads are uncovered except in some long-time oven meals. In most ovens, the arrangement makes little difference because of even heat distribution, provided utensils are arranged so heat can circulate. And even this is not very important when cooking foods in covered pans.

Leaving space between pans and staggering them, so that pans on the upper shelf are not directly above those on the lower shelf, assures good circulation of heat.

Arrange shelves to accommodate the pans of food being cooked. Try to avoid placing the bottom shelf too close to the heat distributor and the top shelf too close to the top of the oven. Arrange shelves in advance if food is being cooked in a preheated oven. This saves loss of heat and possible burns from handling hot shelves.

Cooking the Oven Meal. Most oven meals cook as well from a cold start as from a preheated one. Starting with a cold oven prevents a slight loss of heat during loading, avoids possible burns from improper handling of shelves, and encourages the use of the timer.

With a hot start, total time used in meal preparation is less and cake texture is slightly better.

Cooking time for a cold start is about 15 minutes longer than from a hot start, so 15 minutes can be added to the time for an oven meal calling for a preheated start. If the oven is hot from baking, or if it is decided to preheat it, 15 minutes is subtracted from the time given for a cold-start oven meal.

Removing Food from the Oven. Pull the loaded oven shelves out and unload onto a work space, the surface of the range and the oven door. Reaching into the oven to remove food may cause burns from the shelves. If you remove food quickly, enough heat may be left in the oven to be used for some other purpose. Leave the door ajar at the broiling stop for cooling.

COOKING MEAT IN OVEN

Cooking tender meat in oven: To get a tender juicy, nicely browned roast or baked ham, cook good quality, tender meat in a shallow pan with fat side up at a low or moderate temperature for the proper length of time to reach the doneness desired. Do not cover, add water, or baste.

The shallow pan lets heat circulate around the meat to brown and cook it evenly. Put meat on a rack or let it rest on its own bone. The fat bastes the meat as it melts and drips downward. Cheesecloth dipped in fat is sometimes put over wings and thighs of large turkey to furnish fat and to prevent drying and browning too much. A low or moderate temperature cooks the meat slowly, causing little loss of moisture, little shrinkage. It produces a tender, juicy finished product if the meat was tender meat suited for roasting or baking. If there is no fat on the meat, rub the outside with fat or add bacon strips or bits of fat pork or suet.

Cooking less tender meat cuts: The same directions are followed for the less tender cuts, except that the meat may be browned first quickly to develop flavor and give pleasing color. For this, use a skillet or heavy pan on a surface unit, put meat under the broiler, or in oven while preheating at 400-500°. Then cook, using 300-350° F., a small amount of water ($\frac{1}{2}$ cup) and a cover on the pan. The moisture helps tenderize the connective tissue in the meat.

Another method* is to season and flour the roast and put a little fat over the top of it. Put on a rack in a roasting pan, cover closely and cook until tender at about 325° F. This is the preferable method; it saves time and electricity. The slightly higher temperature produces browning.

Timing: Accurate timing is extremely important. Using the automatic timer, an alarm clock or the time signal helps to get proper timing. Guesswork on timing can be expensive in both meat losses and electrical costs. Unnecessary loss of fat, moisture and weight results from overcooking, giving less meat to serve. A longer time than necessary results in higher KWH consumption. Undercooking may also increase electrical cost through making it necessary later to reheat the oven.

Most timing is given for meat at room temperature. If a lot colder, you may need to allow as much as 10 minutes extra per pound. If frozen, try adding 20 minutes per pound; use meat thermometer to be accurate. When cooking meats frozen, use a low temperature and allow two to four times as long. Frozen roasts and poultry should thaw completely before cooking to save electricity. Refrigerator thawing takes about 5 hours per pound, room thawing about 2 hours per pound. Allow plenty of time. Having meat cold has advantages in connection with cooking meals automatically. A very cold roast can stand about 6 hours in a cold, insulated oven without danger of food spoilage. Frozen meat can stand even longer.

*"Meat for Thrifty Meals," Farmers Bulletin 1908, USDA, Washington 25, D. C.

Temperature: Using a combination of good timing and a meat thermometer as a method for determining temperature inside of the meat is the most accurate and profitable way of cooking meat. There is no guesswork at all in this kind of cooking. Use an ice pick or meat skewer to make the hole for inserting the meat thermometer so the meat's inner temperature can be read. Put in frozen meat after thawing.

The meat thermometer should be put into the center of the largest muscle of the meat. In this location it records temperature accurately.. If it touches bone or fat, the reading will not be that of the main part of the meat you are trying to cook. Bone conducts heat readily and fat conducts it slowly, so be sure to push the thermometer bulb into lean muscle for the reading you want. Read the temperature on the meat thermometer as the end of the cooking time you have estimated from meat cookery charts approaches.

Here are recommended internal meat temperatures: Beef (140 - 175° F.); tenderized ham (160° F.); lamb, smoked pork, veal (170° F.); fresh pork (185° F.). Recommended oven baking temperatures are 300° F. for most meats; 325° F. for goose or 6-9 pound turkey; 350° F. for fresh pork, chicken, duck, guinea; lower temperatures (275 and 250° F.) than these for turkey over 14 pounds, and higher (350-400° F.) for fish.

The following brief general statements of the effects of low or moderate temperature as compared with high temperature meat cooking show the desirability of using the lower temperatures.

Low or moderate temperature vs. High temperature roasting

Meat juicy, tender throughout....	Meat dry outside, juicy inside
Appearance attractive, plump.....	Appearance shrunken, fibrous
Evenly browned but not crusty....	Charred fat and bones; crusty
Uniform doneness possible.....	Brown outside, perhaps raw inside
Little loss by shrinkage.....	Shrinkage loss great; less meat
Leftovers moist and tender.....	Leftovers dry, especially at edges
Few KWH at low temperature.....	More KWH at high temperature
Many foods can cook with meat....	Few foods can cook with meat
Drippings thin, well-flavored....	Drippings dark, sticky, bitter
No smoking; no vent staining....	Fat spatter may cause smoke, stain
No attention during roasting.....	A lot of attention may be needed
Oven easy to clean afterward.....	Oven, vent and door edge stains
Roasting pan easier to wash.....	Roasting pan often hard to wash
Soapy water does cleaning.....	Ammonia, steel wool required.

Directions for preparation of meat:

1. Wipe the meat with a damp cloth, or if fish or poultry wash it in cold water. Let meat warm to room temperature.
2. Season with salt and possibly pepper immediately before roasting or after done, as wished, except in the case of salted meat. Use of flour is optional. Metal skewers hasten cooking.

3. Place the meat fat upward in a low-sided pan unless it is a less tender cut. In this case use a covered pan. Use a trivet under the meat unless there is a bone on which it rests. Try roasting smaller roasts without a trivet or roasting rack.
4. Put pan on a shelf located so that the meat is near the center of the oven if being cooked alone, or on one of the lower shelves if being cooked with an oven meal.
5. Cook according to weight and time and temperature directions given in newer meat cookery guides. Start with either a hot or cold oven. Fifteen minutes difference can be allowed for heating if the starting temperature varies from the directions given. Set the timer to turn the oven heat off 15 minutes or so ahead of the finishing time, in order to use the stored heat to save on current consumption. If there is no timer, set an alarm clock or time signal as a reminder.

OVEN CANNING IS NOT RECOMMENDED

Oven canning is not recommended. The following statements from the bulletin "Home Canning of Meat," published by the United States Department of Agriculture explains why:

"It is not safe to can meat in -- a boiling water bath, an oven, a steamer without pressure or an open kettle. None of these will heat the meat hot enough to kill dangerous bacteria in a reasonable time.

"Oven canning is impossible with tin cans and not safe with glass jars, for more than one reason. Even though oven temperature goes to 250° F. or higher, food inside jars stays at about boiling -- 212° F. Moreover this method has caused serious burns and cuts. Jars in an oven may burst, blowing out the oven door."

BAKING IN THE ELECTRIC OVEN

Summary: Very excellent baking results are easy to get in an electric oven by using tested recipes, good mixing techniques, proper pans, good placement of pans, the right temperature and the correct time.

To get the best baking results preheat the oven for biscuits and other quick breads, for all types of cakes, pastries and cookies. Adjust shelves before preheating. Yeast products and cream puffs seem to bake equally well from a hot or cold start.

Research: Summarized results of research* related to preheating for baking indicated:

Plain cake - "Plain cakes baked in preheated ovens were superior to those baked from a cold start in appearance, texture, velvetiness and eating quality, but there were no significant differences in volume.

Angel cake - "Angel cake baked in preheated ovens were more desirable in texture, tenderness and eating quality and, with one exception, in volume than when baked from a cold start.

Breads - "The biscuits baked in preheated ovens were preferable. Yeast rolls were equally desirable regardless of method of baking.

Cream puffs - "With one exception cream puffs baked equally successfully from a cold and a preheated start in all ranges." In one range which heated slowly they were always poor from a cold start, according to the report.

Time saving - It also showed a saving of time when foods were baked in the preheated oven of the electric range and negligible consumption differences.

Cold start: Cold oven starting can be used for vegetables, fruits, scalloped dishes, meat, yeast breads, nuts or fruit breads, and even some cakes, especially upside-down cakes, gingerbread, fruit and butter cakes, if your standards for texture are not too high.

Planning: Baking with accurate temperature control and good timing is so easy and so cool with electrically operated equipment that many homemakers bake before, after and along with regular meal preparation rather than on a separate day. The separate baking days may return somewhat with home freezers becoming more widespread even then, perhaps it will be easier to bake food for freezing whenever there is a little extra time, rather than all at one time.

* Louise J. Peet and Belle Lowe, "Starting Baked Products in Cold Versus Preheated Ovens," Research Bulletin 213, 1937, Agricultural Experiment Station, Iowa State College, Ames, Iowa.

Ready Mixes: Dry ingredients for several separate cakes or other baked products may be measured, combined, bagged, labeled and stored, ready for mixing and baking on short notice. Store in a dry place, possibly in an empty lard can or in a metal-lined drawer. Ready mixes, both homemade and store bought, save time and muss.

Utensils: Baking utensils should rest evenly on shelves; they should not be warped. And the shelves should be level. Level shelves and level pans go a long way toward producing level, evenly browned products.

The utensil material and the size of the pan in relation to the recipe influence evenness of browning. A small recipe in a too large, deep pan bakes more quickly because of its thinness, and often it does not brown properly on top because of the high sides of the pan. Dark or enamel ware pans and glass dishes absorb radiant heat so rapidly that cakes sometimes become too brown on the bottom before they are brown or done enough on top. Choose cookie sheets with no sides, or very low sides, and small enough to allow heat to flow around them. See separate section on utensils.

Temperature: Follow directions in tested recipes. If baking several foods, bake lower-temperature ones first, then increase temperature and bake others.

Placement: Placement of pans in the oven should permit good circulation of heated air and radiation of heat energy from the oven units. Allow at least an inch between pans and one, or preferably two inches, between pans and oven walls. Stagger pans so that one is not placed directly above another. If a single cake, two pies or two layers of a layer cake are being baked, arrange the shelf so that there is about as much space above as below the food being baked. Briefly, this means to center the food in the oven. When placing food on both shelves, locate shelves so that food is centered at distances $1/3$ and $2/3$ of the distance between units. In placing three cake pans, put two on the lower shelf and one on the upper shelf to get best results.

Steps in oven baking: In baking food in a hot oven, follow the steps below. For a cold start, omit steps 3 and 4.

1. Arrange oven shelves for food being baked.
2. Set thermostat dial to proper temperature. (See 3.)
3. Turn switch or pushbutton to preheat.* (Turn to Broil, then back to temperature wanted on one-dial controls.)
4. When oven signal light goes off, open door quickly and pull shelves forward.
5. Place food on prearranged shelves in correct positions for good circulation of heat. Push shelves back and close door.

*Some ranges with two-switch controls do not have preheat position. Use bake. See manufacturer's instructions.

6. Turn thermostat dial to bake, if not done automatically by one-dial control or preheat button.
7. Time baking carefully. Set an alarm clock or time signal.
8. Remove cake from oven and turn pan upside down above rack.

BROILING OR GRILLING AND TOASTING

Uses of broiler: The broiler grills or broils food, toasts breads, sandwiches or slices of cake and browns casserole toppings, meringues and other surfaces. It will reheat meat and other food already served and starting to cool on a platter.

Broiling may be done under the top heating unit of a two-unit oven, under the bottom unit of a one-unit oven or in a separate broiling compartment or oven where the unit in the top of the space is used.

Parts of broiler: The broiler consists of a broiler pan, a broiler rack and oven unit. When in use the broiler pan rests on an oven shelf in an oven with its door open at the broiling stop position. Heat is turned on by a thermostat dial and/or switch.

Advantages of broiling: Broiling is a fast, healthful, convenient and time-saving way of cooking food.

1. **Fast:** The glowing heat of the broiler cooks a whole meal or some of its parts (the meat, the vegetables or even a dessert) in a short time. Most broiler meals are ready in less than 30 minutes.
2. **Healthful:** Broiling is a healthful way of cooking food as well as a quick way. The fat in and around the meat cooks by low or moderate temperature dry heat, and, since the meat rests on a rack over a pan, the melting fat drips into the pan. Fat has little or no chance to overheat while in contact with the meat. Vegetables and fruits also are healthfully cooked by the broiler as there is no vitamin-wasting water used.
3. **Convenient:** Cooking the whole meal in the broiler saves washing separate pans. However, unless you learn how to use paper to remove grease and a scrub brush to clean the broiler, you may think the convenience of the broiler is largely offset by the problem of washing it. So read carefully the suggestions on cleaning and get full benefit from your broiler. It can save you both time and labor.
4. **Time-saving:** The broiler requires little of your time or attention. You set the time signal to ring a bell when it is time to turn the food under the broiler, and reset it to ring again when the food is done. Without worrying that you might forget, you can be setting the table, making the salad and pouring the milk while your broiler is cooking the food. Your whole meal-time job practically finishes itself without fuss or trouble.

Foods for broiling: A surprising number of meats and most vegetables and fruits will broil satisfactorily. As you would expect, the meats cooked this way should be tender ones, for they are cooked by dry instead of moist heat. Other cuts need moist heat to soften tough connective tissue. However, less tender meat broils satisfactorily when ground.

Veal does not broil too satisfactorily because it has little fat and also considerable connective tissue. Pork is not broiled because very thorough cooking is essential to killing trichinae which are sometimes found in pork unless it has been frozen.* To cook pork thoroughly under the broiler unit would waste a lot of the fat and with it the flavor so characteristic of pork. However, note in broiler timetables that ham, bacon and sausage are broiler meats.

Meat cooked in the broiler needs to be thick, since thin meat often gets done before it browns and then dries as it cooks longer. At least an inch thick is a good rule for a guide. Lamb chops and ham slices might be thinner.

Do not try to broil leafy green vegetables and large raw whole vegetables, such as beets, broccoli, cauliflower, onions, potatoes, turnips, or even some of the smaller raw root vegetables, such as carrots and parsnips. With thick, well-done steak or chicken, you might try experimenting with some of the smaller raw whole vegetables wrapped in aluminum foil or wet cooking parchment. By trying different combinations, you'll discover some interesting foods and some interesting ways of cooking them.

To warm canned or left-over cooked vegetables, place in the broiler pan under the meat and other food on the rack. Always use this method of reheating for peas, lima beans, kernel corn and other small foods. Such foods fall through most broiler racks or dry out under the intense heat if left there very long, unless used as a stuffing for other larger vegetables.

The tender tops of cooked broccoli and asparagus can be protected from overcooking by placing the heads in the center of the pan or wherever they will be covered by the thick cuts of meat on the broiler rack. When vegetables are warmed in the broiler pan, meat drippings season them. To avoid getting too much fat on them, meat can be trimmed more carefully than otherwise. This is especially desirable with lamb.

Planning the broiler meal: Start with the meat or main dish and choose vegetables or fruits that cook in either the same length of time or in about half the time. Thus they go in with the meat or when it is turned. Of course, the foods chosen should go together in color, flavor and texture. Remember that cooked left-over or canned vegetables can go in the pan.

*Pork must be frozen 10 to 20 days as low as 5° F.

Preparing food for the broiler: Let food stand at room temperature a while before broiling. Take food from the refrigerator at least 30 minutes, or preferably 1 hour in advance of broiling, if possible. If not, allow extra cooking time. Frozen food takes longer to warm to room temperature. Allowing to warm causes variation in timing.

1. Meat: Wipe meat with a clean damp cloth or a dry paper towel to remove bone splinters. Partially or wholly thaw frozen meat unless it is very thin. While you can broil frozen meat, it is difficult to judge when it is done in the center. Score fat edges to keep meat from curling; cut edges with a sharp knife, making cuts 1 to 1½ inches apart. Fat on thick pieces rarely causes curling. If the meat is thin, you might brush it with bacon fat or melted table fat so that it will brown quickly without drying. Bits of suet on beef, slivers of fat trimmings or even tiny pieces of unmelted table fat can furnish this outer coating of fat if wished, but they are not necessary to get either a brown or tasty product. Try it both ways for yourself. Try mayonnaise on fish sometimes for variety. Brushing extra fat on bacon or sausage is unnecessary because there is so much fat in the meat.
2. Vegetables: Nearly all vegetables broil more evenly if brushed with melted table fat or dipped in bacon fat first. They are less apt to burn in that area directly exposed to the heat. Dip corn in the husk in water before broiling for the moist husks burn less easily than drier ones. Even then, turn the ears to broil each quarter, for the protective moisture evaporates rapidly. Or you can husk ears and wrap them in foil. Because they have a lot of moisture, you can omit fat from tomatoes, though it improves flavor and lessens chances of crusting and blackening with overcooking. However, if you overcook tomatoes you can remove the thin black crusted area easily with a paring knife.

A thin pat of table fat on top of the cooked frozen corn, peas or lima beans used to stuff tomatoes or other large vegetables, moistens and flavors them and keeps the top layer of these foods from drying. Season vegetables whenever you wish, either before, during or after broiling.

3. Fruits: Drain fruit thoroughly. Brush or dip the surfaces of fruit in melted table fat and sprinkle with brown or white sugar. Keep a salt shaker filled with white sugar for this. Or have brown sugar handy in a covered jar. Here again, experiment. If you want to save time and bother by omitting these steps, you will usually find your fruits hot and quite good but not so nicely browned. And when cooked too long, they tend to have burned patches instead of an even brown. When held under the broiler too long the surfaces of grapefruit halves burn easily without the fat, so add it when broiling them to serve unsweetened

with meat. Sugar alone is enough if you want grapefruit for dessert, though using a little fat too gives a richer flavor to the grapefruit. You will also find this true of some other fruits.

Try different methods of advance preparation of food for the broiler pan. But keep your methods simple. Otherwise it may seem like too much work and keep you from enjoying the use of your broiler.

4. Breads and cake: Toast dry, or brush with melted table fat before toasting.

Steps in broiling food:

1. Arrange food properly in the broiler pan and on the broiler rack. Place drained left-over or canned vegetables in the pan which may be greased or not as wished. Put tender cooked heads of broccoli and asparagus under the meat. Most meat goes in the center of the rack and other foods on the ends and outer sides of the rack. (You can line the broiler pan with foil for easier cleaning, if you wish. Drain fat off of foil and use again. Store it in the refrigerator between uses.)

Place chicken on rack under side up first. Broil skin side later. (The principal reason for this is to prevent rack marks on the skin.)

Fish and beef liver may go on the greased bottom of the broiler pan, on foil or on wet cooking parchment. If fish is less than an inch thick, you need not turn it. Broil thicker fish skin side up first, then turn. Greased parchment, brown paper or foil aids in turning fish by helping to hold it in one piece. It also makes moving it from broiler pan to serving dish simple. Put four layers of paper or two of foil under the meat. Use half for turning, the rest to lift for serving.

You can broil thick liver and fat fish on the rack, but you may have a little trouble in turning the food, especially fish, unless the rack is one of the nearly solid type having wide bars and narrow slits.

2. Turn the switch or thermostat dial to Broil or push Broil button. Sometimes with both a switch and thermostat dial, it is also necessary to set the thermostat dial at the highest temperature or Broil position. Follow your instruction book directions for this and for preheating of the broiler unit. Manufacturers base their timing suggestions on the directions they give, therefore you should follow directions regarding preheating or change timing. Preheating the broiler pan and rack causes food to stick to the rack and may cause dripping fat to smoke. Also

food cooks on the bottom without browning from the heat in the pan. The additional heat required to brown its surface may cause drying and toughening, especially with thin meats.

Modern high-wattage broiler units heat very rapidly to a glowing cherry red, so preheating is generally unnecessary. The unit is usually glowing by the time shelf height is adjusted and the loaded broiler pan is placed on the shelf and pushed into place under the unit.

You can broil in an oven that has been used for baking and is hot, but there is a greater chance of having smoke and spattering of fat with a hot oven. Open the door wide when beginning to broil in a hot oven and later close partially to the broiling stop position. Some broiler pans fit on the oven shelf supports, but unless designed with a lock stop, broiler pans are more easily and safely handled if they are put on a shelf.

3. Arrange the oven shelf and the broiler pan so that the surface of the meat or other foods is 2 or 3 inches below the unit. Larger cuts of meat might go 3 inches or lower and thinner cuts closer. Thin cuts must brown quickly to avoid overcooking and drying. Large thick cuts of meats, such as half a fowl, a thin roast, or a thick steak which is to be well done, must go lower in the oven--possibly even 4 or 5 inches below the unit. This is so that they will get done without becoming too brown.
4. Leave the door open at the broiling stop. This keeps the broiler unit from shutting off automatically. Also cool air enters under the broiler pan, keeping it from getting too hot, and thus preventing smoking.
5. Set the range time signal or an alarm clock to remind you when the food is ready to turn. Add foods that cook in half the time when you turn the meat.

Time required to broil steak or chops depends on

Thickness of cut

Surface area--the larger the area, the longer the time

Temperature--depending on wattage and distance of food from unit

Degree of doneness wished.

6. Turn the food using a spatula, short handled pancake turner, two spoons or tongs. Pricking meat with a fork causes it to leak juices. If a fork is used, place it under the meat, or stick it in near the bone or in the side of meat for turning.
7. Reset the time signal for the second half of the cooking period. Fruits and vegetables added when the meat is turned do not need to be turned. The heated broiler rack and broiler pan will warm

them somewhat from below, and the heat from above is enough to warm or cook the food in the time suggested by the manufacturer's directions. Meat will usually take about 2 minutes less on the second side than on the first.

8. Test doneness of meat by cutting loose at bone enough to see color inside of meat; make small slit in thickest portion.
9. Turn oven off and remove food. Salt meat and other food which needs salting on both sides. You may salt one side before turning in Step 5, and the second side when removing meat.
10. Serve on hot dish. Warm this dish in oven below broiler pan.
11. When it is cool, wash broiler pan, rack and oven. Store broiler pan outside of oven. See section on cleaning and care of broiler pan and oven and on service problems.

What temperatures are used: Broiling at a moderate temperature is the best compromise between cost and results. There is less shrinkage, smoking and spattering of fat than with high temperature broiling, therefore less cleaning of the oven. The finished product is attractive in appearance, for it browns evenly without fat or bone blackening. The meat remains tender and moist while cooking uniformly. Moderate temperature broiling takes slightly longer than high temperature broiling, but it requires no watching. Low temperature broiling has the same advantage so far as finished product, but the time required is longer, and the cost of broiling is greater.

<u>Type of broiling</u>	<u>Top of food to unit</u>	<u>Food for which used</u>
Low temperature	4 to 5 inches	Barbecued meats. Chicken, lobster, thick fish, thick steak - well done, small roasts.
Moderate temperature	2 to 3 inches	Used for most broiling. Meat, vegetables, fruits.
High temperature	1½ to 2 inches (May be moved down in oven after browned)	Thin meats, as ¾" lamb or thinner; ½" ham; other thinner cuts; rare steaks; very brown; toast.

Toasting in the oven: When toasting a quantity of food to serve a number of people, putting it in the broiler is a quick, satisfactory and economical way of preparing it. Small quantity toasting is more satisfactorily and economically done in the toaster.

1. Preheat broiling unit at fastest broiling speed for soft toast. Do not preheat for drier toast.
2. Place bread, rolls, sandwiches or sliced cake you are toasting on broiler rack in broiler pan. Or lay on bottom of the broiler pan as in the case of French toast. Putting foil on the bottom of the pan first eliminates washing the pan.
3. Put broiler pan on oven shelf with toast not closer than 1 inch to unit. To toast cake, sweet rolls and drier toast, place down farther in oven.
4. Toast until brown on each side. Time to learn how long it takes on each side, then repeat timing. Moisture in bread varies results.

OPERATING RANGES WITH CERTAIN SPECIAL FEATURES

TIME SIGNAL OR TIME REMINDER

Uses: The time signal rings a bell as a reminder. One electrical type will control a cooking operation as well as ring the signal bell.

Operation: In using the electrical type set for number minutes wanted by turning timer hand. Wind the mechanical type for short timing operations by turning past the time wanted up to 20 minutes (or any number of minutes past 10). Then turn back to number of minutes wanted.

AUTOMATIC TIMER

Uses: The automatic timer or clock control will turn heat on and off at predetermined time and when you are away from the range. Most range clocks operate one part of the range at a time; some will operate more than one if they are to start at the same time.

Operation: Follow manufacturer's instructions for operation. Or try this:

1. Set selector switch for part of range to be timed.
2. Set dials for cooking period.
 - a. Single button control, turn one direction to set starting time; turn opposite direction to set stopping time.
 - b. Two button control, use one button to set starting time; use other button to set number of cooking hours, or stopping time.
3. Set thermostat dial to temperature wanted in oven or portable cooker. Set switch at position required for cooking to be performed.
4. Turn automatic control to Set or Automatic.
5. Put food in place, preferably not over a couple of hours before cooking starts. This is to prevent spoilage.
6. After cooking, turn control to Off or Manual.

WARMER

Uses: Warm dishes or hold food hot in warmer.

Operation: Follow manufacturer's instructions for operation. Or try this:

1. Turn on 10 minutes before putting food in warmer.
2. Cover rolls or place in covered container. Otherwise they tend to dry.

USING STORED HEAT

Using stored heat for cooking is easy and dependable in the oven with its six insulated sides and an automatic timer that can be set to turn the oven off early. On a range that does not have a timer, an alarm clock or a time signal will serve as a reminder. Retention of heat by the well cooker is also quite dependable. The cooker has either an insulated well or a metal shell which cuts heat losses and protects the utensil from drafts.

It takes experimenting to learn to make good use of stored heat on the surface units of the electric range. Newer units are light weight and fast heating, and they cool more rapidly than older type ones of higher thermal mass. The points below relate mainly to using stored heat from surface units.

Some advantages of using stored heat:

1. Lower operating cost. Lower heats obtainable at lower switch settings use little more electricity than a kitchen ceiling lamp bulb. Difference in operating cost between cooking on a lower heat and Off will not be large, if good use is made of the lower switch positions. The saving is considerably larger and important if higher heats than necessary are being used throughout most cooking.
2. Cooler kitchen in summer. Steam in condensing gives off a large amount of heat. This heat might better be used at the end of the cooking process than wasted into the kitchen to make it become hotter. This is also true of the heat retained in the unit.
3. Lower peak demand. Using stored heat (also low heat) for finishing cooking on surface units and in the oven may help cut system peak demand for electricity. This practice is more apt to be effective on dark days and during winter months or any time meals are cooked and served when the lighting load has come on the lines. Good cooking practices may help an electric system operate more satisfactorily in times of power shortage, and also more economically if it pays for its power according to the period of greatest demand. The main part of the electrical load from a range will be off of the line earlier and make less demand if either low or stored heat is used for finishing the cooking of meals. The true effect of the cooking load on peak demand in rural areas is not known. Power suppliers who have studied the problem in urban areas promote ranges for they find the range load precedes the peaks of power demand in cities. They consider cooking load off-peak load. The matter is being studied in rural areas.
4. Utensils easier to wash. There is no sticking of food. Food already stuck because of too high heat earlier tends to loosen.

5. Less worry when serving. If all units are Off, there is no last-minute scorching or sticking of one food, while serving others.

6. Food is not overcooked. Food is often overcooked by last-minute delays around serving time. It is less likely to overcook and yet still remain hot when held on stored heat. This is also true if held on Simmer.

7. Simplicity of operation. Foods which can finish on stored heat or Off, after being brought to steaming on High, require no further attention. Units are not apt to be left on accidentally.

Some disadvantages of using stored heat:

1. Food may not get done. On very light-weight high-speed units, the units cool rapidly. It is easy to make an error in figuring the amount of time stored heat can be depended upon. Some of the variables are:

a. Weight of utensil, fit of lid. A very light weight utensil with a loose fitting lid loses steam and heat rapidly.

b. Coldness of food. Very cold food, especially in large pieces, is apt to present a problem. With widespread use of refrigerators, a lot of quite cold foods are cooked.

c. Size of pieces. Whole potatoes, both because of the mass of the food and also because they are starch which has insulating properties, are a common food which often acts differently than other foods in relation to use of stored heat.

d. Lifting lid, stirring. Lifting the lid causes steam and heat to escape. If the lid must be lifted, do so quickly, then replace it. Turn unit to High and bring to steaming again, then turn Off.

2. Cooking time may be longer. If stored heat is depended upon for a great deal of the cooking period, a slightly longer cooking time than when cooking is finished on one of the lower heats will be required because the cooking temperature lowers considerably as time passes after the switch is turned to Off.

3. Food value may decrease. Short cooking time is recommended for vegetables and fruits to save vitamins.

4. More trips to range may be made. To start food on High, turn to Low when steaming, then Off near end of cooking requires an extra trip to the range over turning to High, then Low and leaving on Low. Foods which can be turned to High until steaming, then Off to finish will not require an extra trip to the range or extra clock watching.

SOME GENERAL RULES ON CARE,
CLEANING AND ECONOMICAL OPERATION OF THE RANGE

Good use and care of the electric range is good economy. Generally it cuts both operation and maintenance costs. And it saves time and energy. Here are some points to keep in mind.

Avoid overheating and wasting heat: Overheating shortens the life of units and may damage the finish of the range. It makes stains more difficult to remove, may cause checking and discoloration of porcelain enamel and heat-cured paint or lacquer, and it wastes electricity. Some helpful hints include:

1. Heat water in electric teakettle, water heater or elsewhere than on range. Heating quantities of water on the range wastes electricity, uses valuable space on surface units, and gives heavy wear to cooking top.
2. Heat kitchen with separate or built-in electric or fuel-burning heater, or by some other means than using range oven or surface units.
3. Except for brief preheating, do not operate units without cooking load as they overheat more easily and waste electricity.
 - a. Adjust oven shelves before preheating to avoid wasting heat.
 - b. Preheat oven only as long as necessary. Set time reminder so you will not forget.
 - c. Put utensil on surface unit; then turn switch to cooking heat wished. Modern units heat very rapidly.
 - d. Turn switch to Off before removing food. This prevents heat and electricity from being wasted by forgotten units or ovens.
4. Time the starting period on High when steaming, frying and doing other cooking on surface units. Use time signal especially for steaming. Its ringing reminds you to turn switch to position for lower heat.
5. Use correct switch positions for food being cooked.
 - a. Cook protein dishes (meat, milk, cheese, eggs) at low or moderate temperatures. High temperatures toughen protein.

- b. Start other foods cooking rapidly, turn down to lower heat as soon as possible.
6. Make good use of lower heats and Off to finish top-of-range cooking. However, when using stored heat, food flavors will mix. Therefore, use low heat to finish cooking if this is undesirable. Food cooks as fast with slow boiling as with rapid boiling, because the temperature is the same. Use time signals and controls to avoid overcooking.
 7. Use automatic timer to control time oven turns on and off. In long-cooking processes, set timer to turn oven off at least 15 minutes or longer before end of cooking time. If timer controls other parts of range, use it as frequently as possible on these parts as well as on oven.
 8. When using very large pressure cookers or water bath canners, raise units with a metal canner ring or metal pieces, or use 2" pieces of asbestos shingle. This is very important if range construction does not raise unit far above cooking top, or if bottom of utensil is recessed or flanged and extends over unit.
 9. If you use aluminum foil on a reflector pan to keep it clean, be sure to make a hole in it to correspond with hole in reflector pan.

Avoid spillovers and spattering: This saves you time and effort. It also keeps your range looking better longer. These points may help you:

1. Use large enough utensil for food being cooked. Use deep pie pans and casseroles large enough so that you fill them only about 2/3 full. Put cereals and sweet liquids in proper size pans as they boil over easily.
2. Use small amount of liquid whenever possible. This prevents boilovers and saves electricity too.
3. Start food preparation on time so you will not try to hurry cooking.
4. Use low or moderate temperatures for meat cookery.
5. Experiment with timing so you know how long it takes to cook food so that it pleases your family. Timing or careful watching helps prevent spattering and boilovers. Follow directions and write on recipes any timing changes you want to make so you can repeat them. Then use time signal or time control to be accurate and avoid forgetting.

6. When you forget to time or do not know time required, feel of lid to determine progress of food's heating on a surface unit. If lid is hot, food will soon be steaming, ready to finish cooking on lower heat.
7. Whenever possible, cover foods that spatter when cooking such as some foods being fried. Do not cover tender roasts or foods broiling in oven. When frying in an open utensil, cover adjoining units not in use with paper or wipe units off before heating them. Wipe both metal rings and reflector pans if there is spattering of fat.
8. Use moderate heat and little moisture to help decrease spattering during frying. Turn heat low when food is brown.

*Avoid sudden changes of temperature on enamel parts: A sudden change of temperature produces uneven expansion or contraction between one area of glass-like porcelain enamel and the metal underneath, also between this enamel and surrounding enamel. This may cause checking. Porcelain enamel is like glass, very durable unless badly treated. Follow these rules, especially on older type porcelain enamel:

1. Cool enamel thoroughly before washing. Also avoid using very hot water on very cold enamel.
2. Wipe any spilled food from a hot range with a dry cloth or soft paper instead of with a damp cloth. Remove acid food immediately. Wipe off with paper or dry cloth. Turn unit off as soon as possible. When the range surface is cool enough to touch, you might use a damp-dry cloth wrung out from very hot water.
3. Avoid placing very hot utensils or hot liquid on very cold enamel or cold utensils or liquid on hot enamel.
 - a. Use a protective mat on the work space while canning to avoid placing hot utensils on cold porcelain enamel, as well as scraping top or leaving aluminum marks.
 - b. Leave broiler pan on oven shelf or place on surface unit or heat proof mat while removing food from it.
 - c. Leave pans on surface units while dishing up food for serving.

*Avoid scratching, sharp blows, jarring: Scratches or roughening tend to cause an enamel surface to stain easily and pick up dirt.

1. Use mild soap and water or kerosene and water on white enamel. If you need an abrasive, try baking soda or whiting. Harsh cleansers or gritty soaps may toughen the surface by scratching the glass-like finish.

*New type of porcelain enamel used by many manufacturers is claimed to be far more durable than older types, which have lasted well with good care.

4. Use protective mat on the work space to help prevent marring cooking top. Use it all of the time, or store it on edge at the side of the range to put on the work space during heavy usage.

Keep moisture and grease away from electrical parts: Avoid getting water on open units, terminals, leads or wires, switches, outlets, lamp sockets, time signals and time controls. Encased tube or rod units are not hurt by water. However, even with them it is better to follow suggestions below to keep water out of terminals, leads and other electrical parts near them. **TURN UNITS OFF BEFORE CLEANING.**

1. Clean with damp cloth instead of using quantities of water. Wring out soapy and rinse cloths until nearly dry before using them to clean around electrical parts.
2. Remove oven units before cleaning oven liner. Lay them in dry spot. If the oven liner is very soiled and scrubbing is necessary, use a bristle brush and a thick suds but little water. Avoid getting water or soap into terminal block.
3. Dry parts near wiring after cleaning, especially reflector pans, drip tray and bottom of oven. Turn on units to save time in drying some of the other parts.
4. Use small amounts of water in oven cooking. It is economical of electricity and prevents condensation in vent and around terminals. Leave oven door open at broiling stop while cooling to let moist warm air escape, instead of condensing around the terminal block and element wires of open coil units and on other parts. With encased tube units and one-piece porcelain liners, leaving the door ajar for cooling is not important.
5. Use small amounts of water in top-of-range cooking. This helps prevent boilovers.
6. Use low heat in cooking milk dishes because milk boils over readily especially when covered. (This is recommended practice to keep light from destroying vitamins.)

Keep parts clean: Reflecting parts which no longer shine waste heat. Dirty reflector pans absorb heat instead of reflecting it to utensils above. Dirty oven surfaces do not radiate heat as well; the rough surfaces absorb a lot of the radiant heat instead of reflecting it. Clean parts also prevent smoking and odor as well as heat loss, and they look better longer.

1. Remove food as soon as spilled, especially acid foods. Use a dry cloth or soft paper if range is hot. Wash as soon as cool. Or when you can just hold your hand on enamel, you might wash remaining acid off with cloth wrung out from very hot soapy water. Rinse and dry.

2. Remove spilled or dried and burned on foods with paper or cloth, instead of a sharp instrument or wire brush, which may roughen or clip enamel surface.
3. Avoid opening tin cans on the cooking top. This scratches and stains enamel and leaves metal marks on it.
4. When canning use a rubber mat, metal-covered asbestos mat or thick layers of towelling on the range work space.
5. Avoid scraping enamel with pans while dishing up food.
6. Close oven door gently, if not well counter-balanced. Have spring adjusted if door snaps shut. Jarring may chip enamel.
7. Pull loaded shelves slowly forward to unload. Sometimes if shelves are jerked, heavy, hot dishes slide off the back or front of the shelf and drop on enamel surfaces. This rarely happens if shelves are put in the oven correctly for they have a wire or bar to stop sliding pans.
8. Avoid placing heavy roasting pan on open oven door. Set heavy utensils down gently. Striking a very sharp blow may break enamel surface.
9. Do not leave oven door wide open while not in use. Someone might run into it and injure himself and the range finish. Leave door open at broiling stop.

Avoid damage by acids and alkalis: These may dull the gloss on enamel, even if it is acid-resisting enamel. Use special care to avoid getting acids or strong alkalis on cooking top. For cleaning suggestions in case of spillage, see point 1 in section titled "Keep parts clean."

1. Avoid using harshly alkaline cleansers on white enamel. See 1 in previous section.
2. Be careful to avoid spillage, dripping or boilovers when handling or cooking the following:

Tomatoes	Vinegar	Tea
Fruit	Milk	Cocoa

See suggestions in previous section on "Avoid spillovers and spattering."

3. Put a small dish, a coaster or a small tray on the range work space to hold cutlery used at range. Put vinegar, lemon and other acid seasonings on a saucer.

2. Wipe off range surfaces and oven interior after each meal in which these are used, with either damp cloth or dry one. Use soap if necessary. Clean up any spattering or spillage. Let cool before cleaning.
3. Plan a schedule of regular weekly cleanings and occasionally very thorough cleanings. Disconnect range at main service entrance for thorough seasonal cleanings.
4. Reread manufacturer's cleaning instructions occasionally.
5. Plan a time and energy saving system of cleaning.
 - a. Remove to the drip tray all parts to be washed in dishpan or sink. Carry tray to sink and wash parts there. Dry and carry back on tray. Replace parts after cleaning rest of range.
 - b. Determine a good order of cleaning with some system to it which you can remember. You might first clean all exterior parts, working in general from top to bottom and from right to left; then all interior parts. Consider the following points:

Saving time and motion

Keeping washing water clean as long as possible

Not streaking washed parts by cleaning other parts.

- c. For both the weekly and the thorough cleaning, carry to the range a tray with whatever items you will need from the following list:

Soapy water

Clear water

Dishcloths (2)

Soft rags or dishtowels (2)

Whiting, baking soda, or enamel polish and
metal polish

Fine steel wool (000)

Ammonia if needed for oven

Paper towels - waxed paper

You might keep a pint jar of whiting and steel wool in a range storage drawer.

- d. Dry surfaces with soft cloth and by turning on units. A soft cloth helps to polish all surfaces and makes them better heat reflectors. You might use soft rags for this drying rather than regular dishtowels to prevent staining the dishtowels. Dry rags can help in the cleaning.

General cleaning pointers: Turn switches to Off before cleaning parts. Let enamel parts cool. Use any of the following cleaning agents and equipment or a combination of them:

1. White porcelain enamel:

Damp cloths and dry cloth for drying and polishing.
Mild soap and water. Or kerosene and water.
Whiting, baking soda or enamel polish for stubborn spots.
Borax or a liquid laundry bleach to bleach stains. (Rinse well.)
(Avoid acid and strong alkaline substances and harsh cleansers.)

2. Colored porcelain enamel:

Same as above.
In addition for stubborn spots, ammonia, 000 steel wool, mild cleansing powder or commercial degreaser.
Soda and water to boil in porcelain cooker utensil in which food has burned. (Soda darkens aluminum utensils.)

3. Heat-cured paint or lacquer (baked-on synthetic enamel):

Mild soap and water.
Cleansers and polishes for autos or refrigerators, or whiting.
Wax
(Avoid acid, alkali and harsh cleansers.)

4. Plastics:

Mild soap and water, or some of new soapless detergents.
(Avoid abrasives, cleaning fluids.)

5. Chromium:

Cloth for applying cleanser. Soft cloth for polishing.
Soap and water.
Metal polish, whiting and alcohol, or whiting and water.
Ammonia for burned-on grease if metal rings are removable.
Fine steel wool (000) or fine cleansing powder for stubborn stains which nothing else will remove.
(Avoid steel wool and harsh abrasives.)

6. Aluminum:

Cloths for washing and drying.
Soap and water.
Aluminum cleansing powder, whiting or vinegar and whiting.
Fine steel wool (000).
Acids to brighten aluminum. Rub with half lemon and whiting, boil vinegar and water or cook tomatoes, plums, rhubarb, sour milk or other acid foods in pan.

(Avoid alkaline substances, such as soda, strong soap, ammonia or cleansing powder.)

7. Open coils:

Heat to burn off spilled food.

Tin pie pan fitting unit and sprinkled with moisture to clean white pottery support. No cleaning is needed if support is finished in black.

(Avoid getting salt, soda, soap, acids or alkali and moisture on element wires.)

CARE AND CLEANING OF SPECIAL RANGE PARTS

Exterior surfaces: The exterior surface of a range is usually porcelain enamel; occasionally, on less used parts, it is heat-cured paint or lacquer (baked-on synthetic enamel). Both finishes are easy to clean.

Care

1. Avoid overheating, spillovers, spattering, sudden changes of temperature, scratching, sharp blows, alkalies, acids.

Cleaning

1. Wipe off top after each meal.
2. Clean thoroughly once weekly with mild soap and water. Rinse with clear water and dry.

Cooking top: The cooking top of the electric range is acid-resistant porcelain enamel. It is a glass-like substance, very durable and as easily cleaned and cared for as a fine china dish. Wipe with a damp or dry cloth after each meal, and wash thoroughly when soiled and at least once weekly.

Care

1. Put a dish, coaster or small tray on top for cutlery. Place tin can on paper when opening.
2. Cover work space with double layer of cloth or mat of asbestos and metal, or rubber during canning or heavy use.
3. Use asbestos pieces* under unit, or raise unit for large overhanging pans, especially those with recessed or flanged bottoms. See canning section.
4. Move heavy pans without dropping or dragging.
5. Wipe up spilled food immediately, using dry cloth or soft paper if range surface is hot.
6. Use care in handling acid foods. (tomato, vinegar, fruits, tea, cocoa, milk). If spilled, wipe off with paper or dry cloth immediately. Wash as soon as cool, or use cloth wrung out of hot water on warm top.

Cleaning

1. Wash with cloth wrung out of soapy water when range is cool.
2. Rinse with cloth wrung out of clear water.
3. Wipe dry to polish. Or let dry by evaporation.
4. Soak stubborn spots with soapy water. If necessary rub with whiting or baking soda.
5. See following sections:
 - Surface units
 - Metal unit rings
 - Reflector pans
 - Well cooker
 - Drip tray
 - Metal parts
 - Range lamp
 - Time signal and time control
 - Switch knobs or dials
 - Metal parts of range.

*Cut 2x2-inch pieces from asbestos shingle.

Care

7. Use a small amount of liquid, and control heat carefully to prevent boilovers, overheating.

Surface units: Range units are self-cleaning. Heat burns foods off, leaving unit clean. Cleaning directions below are for encased units.

Care

1. Rotate use of surface units, and vary direction of turning switches to give equal usage.
2. Avoid twisting or pulling leads or wires to surface units when cleaning. Avoid spilling water or grease on them.
3. Wipe up food spilled on unit to prevent unnecessary smoking.
4. Avoid jarring by careless use of heavy utensils, especially on open units.

Cleaning

1. Burn food spilled on unit until charred black and crisp.
2. Turn switch to Off. Let cool.
3. Wipe off food with cloth, or brush with fine bristle brush. Do not scrape.
4. Wash when cool with damp cloth. Use fine abrasive if needed.
5. Darken and polish with waxed paper. Warm unit slightly to melt wax. This finish will not last long.

While there are several open coil well cooker units, open coil units are not sold for surface units on newer ranges except on one make and then only by special request, but they are found on many ranges already in homes.

The open unit with a black finish needs no special cleaning. Heat will burn spilled food crisp and black, and blowing will usually remove charred particles. A fine soft brush will remove stubborn pieces. Avoid using a stiff bristle brush or a sharp instrument which may be injure coil. If you turn the range off at the main switch, you can use a vacuum cleaner to remove such particles.

Metal unit rings: The rings surrounding the units are easy to clean unless you let fat burn on them.

Care

1. Decrease heat after heating skillet and fat to prevent spattering on nearby units. Cover skillet if possible.

Cleaning

1. Lift outer metal ring and, if possible, move out of way.
2. Wash edges of opening in cooking top, under metal ring.

Care

Cleaning

- Or, put paper over adjoining units if not in use or wash before using rather than cleaning off fat burned on when units are heated later.
2. Avoid overheating. Use lower heats after starting cooking.
 3. Wash metal ring. Remove spots with whiting or use 000 steel wool if very stubborn. Dry and polish.
 4. Return metal ring and press it, then press unit into place.

Reflector pans: Most reflector pans can be removed for cleaning. Lift unit first. Remove pan by placing finger through hole in center and pulling forward and out. The swivel type unit has a pan which must be washed at range. Let cool first, then raise unit and clean. Since reflector pans are made of the same materials as utensils, they are cleaned like pans used on the units.

Care

Cleaning

1. Keep clean and bright to maintain high reflecting ability. Avoid spattering fat from nearby unit and spillovers.
2. Use little water. Turn switches to lower heats when cooking is started.
3. Try covering blackened reflector pans with aluminum foil, molding closely. Make hole in bottom.
1. If badly soiled, soak with hot soapy water.
2. Rub stubborn spots with whiting, fine steel wool (000) or a scouring pad, if necessary.
3. Wash with soapy water.
4. Rinse in clear water.
5. Dry.
6. Replace securely.

Well cooker: Well cookers are easy to care for and clean. Follow manufacturer's directions for use and care of pressure cooker, if there is one.

Care

Cleaning

1. Do not heat empty or boil dry. Aluminum utensil may melt.
2. Stir foods in aluminum cooker with wooden spoon to avoid scratching metal.
3. Keep aluminum utensil clean and bright, free of pits or small holes in metal by emptying promptly. Do not store food or hold water in cooker utensil.
1. Turn switch to Off. Let cooker cool.
2. Raise the well slightly and wipe under the metal ring.
3. Wash the metal ring and polish.
4. Wash the walls of the well with a damp cloth. Dry.
5. If there is a reflector pan, lift unit, remove pan and wash it. Dry.

Care

Cleaning

4. If cooker is enamel, avoid sudden temperature changes, sharp blows, scraping burned-on food with a sharp instrument.
5. Cool cooker well before storing utensil in it. Take pressure lid off or leave ajar to keep from melting safety valve if switch is turned accidentally.
6. Wash utensil and lid. If insulated, wipe lid instead of washing in water.
7. Polish aluminum utensil occasionally with whiting or aluminum cleanser. Use dilute acid if stained. All accessory utensils can be washed as pans in the dishpan.
8. Reassemble cooker. Leave lid ajar. Let well cool before replacing utensil.

Drip tray: The drip tray is usually a large flat tray directly below the units and inside a storage drawer or storage compartment. A few are divided trays with the front section overlapping the back section. In ranges with two units on each side of the work space, there are two drip trays, one on each side and below the units. Sometimes they are at the bottom of the range. Often you must remove the storage drawer to take out the drip tray. Locate drip tray under units and learn how to remove by reading instruction book. The tray can be dusted with a clean dry cloth when cleaning the cooking top. It is desirable to wipe regularly, so that spillage can be recovered.

Care

Cleaning

1. Wash regularly to prevent overflowing and odor from spilled food.
2. Avoid striking and chipping enamel when cleaning.
1. Wash in hot soapy water.
2. Rinse and wipe dry.
3. Clean surface units, wash under rims and clean reflector pans.
4. Replace properly, being sure tray is level.

Range lamps: There are numerous incandescent lamp bulbs and often a fluorescent tube in the modern electric range. Sometimes these need replacing. And the ones used for lighting need regular cleaning. Read your instruction book carefully. Your dealer can help you get small indicating lamp bulbs.

Care

Cleaning

1. To remove fluorescent tube, grasp firmly at both ends of tube and give $\frac{1}{4}$ turn. Screw out incandescent bulb.
1. Remove lamp shade, if possible. Wash with warm soapy water. Rinse and dry.

Care

2. Avoid jarring lamps in cleaning and in use.
3. Leave lamps on when away from range for only short time. The burning life of a fluorescent tube is longer if it is left on instead of being turned on and off frequently. The tube uses little electricity.
4. Replace burned out lamps with daylight (blue) bulbs or tubes of size that came with range or instruction book suggests. Secure firmly in socket.

Cleaning

2. Remove, and wipe bulbs with damp cloth. Do not put in water or get base wet. Wash with damp-dry cloth and then dry glass. Dry moisture that might happen to get on metal parts before replacing.
3. Replace lamp bulbs or tubes and shields.

Time signals and time controls: This equipment needs little attention.

Care

1. Have serviceman check during regular check up of range.
2. Avoid overheating and excessive moisture at range.

Cleaning

1. Dip a cloth in clear rinse water and wring very dry and wipe outer surface of timing device. If this does not remove soil, try soapy cloth.
2. Dry thoroughly.

Switch knobs or dials: Most switch knobs or dials come off easily for special cleaning. Avoid removing too frequently as some may loosen too much, but remove often enough that they do not stick tightly.

Care

1. Vary order of turning switches to get even wear.
2. Avoid handling switches with grease on hands.

Cleaning

1. When badly stained underneath, pull dials forward and off if easily removable. If not, pull dry cloth under edges of switch and work off with cloth, or wipe thoroughly using a back and forth motion with cloth under the knobs.
2. Clean switch knob with soapy cloth wrung very dry. Wipe off and dry.

Metal parts of range: There are many metal parts on ranges, such as switch knobs, trim on lamp, oven vent grill, door and drawer handles and toe space.

Care

1. Avoid harsh abrasives which may scratch fine finish.
2. Use range carefully to avoid spillovers and spattering.

Cleaning

1. Rub with a dry cloth to polish.
2. If stained, apply whiting and alcohol or whiting and water. When dry, rub off powder.
OR wash with soap and water, polish with a dry soft cloth.

Oven liner: An oven is easy to keep clean when used properly. Wipe out after each use, removing grease before it has a chance to stick or bake into the enamel. Clean thoroughly once each week, as follows:

Care

1. Pull straight out on oven units when removing. Grip units firmly on both sides at front or use handle on units. Lay open units on dry surface. A few units are not removable.
2. Do not bend, move or damage oven thermostat in cleaning oven.
3. In replacing unit, insert prongs properly and push unit all the way back into terminal block.
4. Roast and broil at moderate or low temperatures to avoid spattering of fat on units and oven walls.
5. Open door to dry moisture from oven after using. Leave door ajar at broiling stop.
6. Clean oven when cool to prevent food stains baking on when using oven again.

Cleaning

1. When cool or only slightly warm, strip oven down to liner, take out all removable parts, such as: broiler pan and rack, shelves, upper unit and its reflector, lower unit and heat distributor and divider, if there is one.
2. Soak spillovers or stain with warm soapy water, a commercial degreaser or ammonia. To clean greasy or badly stained oven soak whole oven and door with ammonia using one of these methods:
 - a. Wipe with cloth dipped in ammonia and water.
 - b. Wipe and leave cloth overnight or a few hours.
 - c. Place $\frac{1}{2}$ cup ammonia in sauce dish on shelf. Close oven; let stand a few hours.

Care

Cleaning

- d. Wipe oven with ammonia. Put large heavy cloth or thin layer of newspaper in bottom and saturate with weak solution of ammonia and water. Close oven and let stand overnight.
3. Wash with warm soapy water, scrubbing with stiff bristle brush and thick suds, if necessary. Or, use fine steel wool or cleansing powder.
4. Rinse and dry.
5. Turn on units to dry thoroughly.

Oven door: A serviceman can usually adjust an oven door which leaks heat because it has been sprung or which snaps shut because of a tight spring. Having these things remedied reduces care and cleaning.

Care

Cleaning

1. Close oven door carefully if not well counterbalanced.
2. Avoid leaning on door or placing very heavy pans or weights on it. Do not let children sit on it. It may get out of line and let heat escape.
3. Leave ajar at broiling stop while cooling.
1. Follow directions for cleaning oven liner.
2. Wipe off any brown stains on exterior with soapy cloth. Rinse and dry.

Vent: The vent pipe runs from the oven to an outside opening. It may open in the center of the cooking top, through a surface unit, into the drip tray under surface units, at the back of the range or through the oven door.

Care

Cleaning

1. Use a small amount of moisture on oven foods to prevent excessive amounts of steam forming in oven and condensing in vent pipe.
1. Remove outer grill and scrub under side with stiff bristle brush.

Care

2. Use proper temperatures.
Too high temperature forms extra steam.
3. Leave door ajar at broiling stop while cooking.

Cleaning

2. Read instructions for removing vent pipe if it is removable. Clean occasionally, pulling a cloth through it.
3. Empty condensing cup, if there is one.
4. Replace parts carefully.

Broiler pan and rack: Find a simple way to clean your broiler pan and rack. Easy cleaning of the broiler makes broiling a joy. Here are some ideas.

Care

1. Store pan and rack outside of oven in storage space where there is often a special support for it.
2. Use aluminum foil as lining for broiler pan to eliminate tedious cleaning.
3. Pour drippings and fat into skillet to make gravy; or take special care, use low heat, stir with wooden spoon if you use broiler pan on unit.
4. Let pan cool before putting it on a cold or wet surface or in water.
5. Avoid scraping with sharp instruments in removing burned-on food. This avoids chipping enamel.
6. Clean broiler pan and oven after using broiler to prevent spatter from burning into enamel when used again.

Cleaning

1. Pour fat out of broiler pan when through using. Or let cool and remove with spatula or rubber scraper.
2. Wipe pan and rack clean of fat with soft paper. Or change layers of newspaper in pan until grease is absorbed.
3. Wash in hot soapy water.
4. Scrub pan and rack with stiff bristle brush or dishcloth. Use ammonia on stubborn spots. If necessary rub with fine steel wool or a fine abrasive cleansing powder.
5. Rinse with clear water.
6. Dry.
7. Store outside of oven.

Oven units: Oven units are self-cleaning. If they are removable, always pull straight out and replace carefully to avoid injury to terminal prongs.

Care

1. Avoid getting water on open unit. Water does not harm encased type; do not immerse, however.

Cleaning

1. Let spilled food burn off.

Care

2. Remove units while cleaning oven to prevent their getting wet. Lay in dry place.
3. Do not get alkali, acid, salt, soda or sugar on open units.
4. Leave door ajar after use to let moisture escape.

Cleaning

2. Encased type can be wiped off with damp cloth. Dry contacts thoroughly before replacing, if they happen to get wet.
3. Rub prongs with 000 steel wool if rough, and grease with unsalted fat if hard to remove or replace unit in oven.

Heat distributor: This is above the lower oven unit and is usually removable.

Care

1. Avoid dropping and sudden temperature changes.
2. Replace properly following labels found on it.

Cleaning

1. Wipe with damp cloth when oven cools. Wash with soapy water after food spills and during regular weekly cleaning.
2. Use soapy rag or ammonia to soak stubborn spots. Or try fine steel wool.
3. Wash again with cloth wrung from soapy water.
4. Rinse with clear water.
5. Dry thoroughly and replace in oven.

Oven shelves: Oven shelves require little cleaning unless food spills on them.

Care

1. If shelves squeak, oil with unsalted fat and heat in oven at 500° F until fat burns off shelves.
2. Shelves which still squeak and are hard to move may need to be bent.

Cleaning

1. Wash. Scrub with bristle brush and use fine steel wool, if necessary, to remove spots.
2. Rinse.
3. Wipe dry.
4. Replace correctly after cleaned. Place lock stop at back.

Shelf supports: Most shelf supports are a part of the oven liner. Wash them with it. Removable shelf supports usually hang on the liner sides. Lift these to remove. Clean with a scrub brush and soap. Or soak with ammonia if badly stained, then wash, rinse and dry.

Storage space and warmer: Most storage and warmer drawers come out easily if you pull the drawer out as far as possible, then lift up on it at the front or back. Sometimes there is a catch on the bottom and at about the center of the drawer. Open the drawer, raise this catch and pull out drawer.

Care

1. Organize utensils kept in storage space for ease of use.
2. Avoid banging and scraping utensils on enamel or metal.

Cleaning

1. Wipe dust from interior and exterior of drawer or compartment. Use dry or damp-dry cloth.
2. Wash drawer inside and out at regular intervals. Rinse and dry.
3. Use a damp cloth occasionally to clean compartment into which drawer fits. Dry.

Fuse: A fuse, or fuses, is usually located in or near a storage space in the range. Remove the drawer, if not readily visible. Sometimes fuses are reached by removing a rear surface unit. The instruction book tells where to find fuses. If not, call the dealer who sold the range. (This fuse is a 15-amp. one. It protects outlets, other 110-v. features.)

Care

1. Open main or range protective device to replace fuse.
2. Replace fuse with 15 ampere fuse.
3. Keep dry.
4. Avoid overloading.

Cleaning

1. A fuse needs no cleaning.
2. Wipe dust from around area with dry cloth when cleaning range thoroughly.

Range check-up: While there is little that can go wrong with the electric range, it might be wise to have a competent serviceman examine the range at regular intervals of three to five years. Here are some things that might be checked:

Levelness of range
Condition of wiring
Tightness of connections
Voltage
Adequacy of grounding

Operation of units
Accuracy of thermostat
Oiling of clock
Oven door and springs
Cleanliness of vent

Moving range: In moving, it is wise to have a range handled by experts. For long moves involving shipping, it should be reboxed in its original crating or in a crate secured from the dealer. Careful movers can protect the range for short moves, or an electrical dealer might be hired to move, install and check the range again after moving. The points listed above are a good guide for checking. Notice to a power supplier about a move should result in the proper transformer size and adequate service to the range in the new location.

SERVICE PROBLEMS ON ELECTRIC RANGES -- THEIR CAUSES AND REMEDIES

Modern electric ranges are so highly perfected that they should give excellent and trouble-free service. To give good service they should be properly wired, checked for levelness and accuracy of temperature control when installed, and then used correctly.

In order to get good use and long service from an electric range, read and follow closely the directions in the manufacturer's instruction book. Attend meetings, read articles and talk with many range users about best methods of use and care. The power supplier should check the adequacy of electric service for operating a range, and the dealer who sells a range is responsible for levelling and checking oven temperature and other points related to good operation.

Never try to investigate or repair major range difficulties. Call a dealer or a serviceman. Give all information on range nameplate when calling the dealer to ask for service. If he knows range model and the nature of the difficulty, it may be possible for him to correct the trouble on the first trip.

The cooperative office should be able to give help if there is a problem in securing service for equipment. The co-op manager may be able to aid in getting service from the proper dealer or distributor, or knows of someone who can help. If all this fails, write the manufacturer about the problem and ask for a service manual. A skilled serviceman or electrician can often solve the problem if he has the proper service manual.

Here are some operating complaints and service problems encountered with electric ranges, with some of their causes and remedies.

Improper Grounding, Faulty Insulation, Slow Heating, Dimming Lights

1. In rare instances, wires within the range may become damaged; a breakdown in a heating element may occur or grounding of range may be defective. In such cases, disconnect the range until these conditions are corrected by a serviceman. Never continue to use equipment which gives an electrical shock.
2. If there is slowness in heating of surface units and in pre-heating of the oven, it may be due to:
 - a. Inadequate transformer size. Total electrical load of farm and home equipment may be too great for transformer installed on pole, also for size of wires running from main power line to house. Consult cooperative manager or other personnel. Size of load and distance determine wire size and transformer size. Range and water heater installations should not be made on transformer sizes less than three KVA.

- b. Main service entrance wires on side of house too small. Consult a local wireman or have cooperative personnel check this. A minimum of 3-wire #6 is recommended.
 - c. Inadequate wiring in home. Consult a wireman or cooperative personnel. It may be necessary to increase the size of the wiring (3-wire #6 recommended) and main service entrance box installed (60 amp. or larger recommended).
3. If range causes lights to dim, it may be due to:
- a. See 2b above.
 - b. See 2c above.

High Bill Problems

1. If electric bills are higher than expected after addition of range, it may be due to:
- a. Learning to use range.
 - b. Heating quantities of water on range. Use electric tea-kettle or water heater. Insulation around water heating container lowers heating cost and helps hold heat with little loss.
 - c. Heating kitchen with range. Provide other means of heating. A fan will help circulate heated air.
 - d. Making unusual use of range, such as canning. Electrical usage by the range may be higher during certain seasons because of extra meals or food preservation.
 - e. Failing to plan meals so that several foods are cooked at once in the oven, in well cooker or on surface units. Try one-dish meals often, using surface unit or well cooker.
 - f. Using large surface unit or oven too frequently. Cook as much food as possible on smaller low-wattage surface units and in well cooker.
 - g. Using pans that are warped or rounded on the bottom for surface unit cooking. Flat-bottomed, straight-sided pans, tightly covered, are most economical. Food heats more quickly in them, therefore, you can turn heat down more quickly.
 - h. Using pan too small for unit or heat selected, thus wasting heat. See if range units have a separate coil for smaller pans. If not, use larger pan for job.
 - i. Leaving switches on High or upper heats too long. Turn to lower heats when boiling starts or frying food begins to brown.

- j. Opening oven door or peeking too often during cooking process. Follow time and temperature directions and let the range do the work. Opening the door cools the oven, lengthens cooking time. Lifting lid to look or to stir food on surface units produces same effect.
- k. Following old-fashioned methods of cooking which requires more consumption of heat. See j above. This also includes using a double boiler instead of low heat and an ordinary pan; and covering foods with water, instead of using $\frac{1}{4}$ to $\frac{1}{2}$ cup, or cooking in 2 tablespoons of fat and 2 tablespoons of water, or covering the bottom of the pan with $\frac{1}{4}$ -inch or less of water. Only dried foods or soup or stew meats need to be covered with water.
- l. Failing to use stored heat available, thus wasting heat and electricity.
- m. Installing range on inadequate service. See "Improper Installation."
- n. Adding some other equipment at about same time.

Failure or Trouble in Operation of Range Parts

- 1. If both surface units and oven units will not heat, it may be due to:
 - a. Disconnected range plug. If house lights will go on, look at range plug. If loose, push in firmly.
 - b. Blown range fuse at main entrance. If plug is pushed in firmly and house lights will go on, try changing range fuse or tripping breaker.
 - c. Blown main fuse on main house line. If lights in house are off as well as range, the main protective device may be blown or tripped.
 - d. Outage, power off temporarily in neighborhood. Inquire by telephone to learn if power is off. Notify co-op office or outage reporting co-op member in neighborhood.
- 2. If either a surface unit or an oven unit will not heat, it may be due to:
 - a. Time control (automatic timer) setting at Automatic (or Set) or Off. Change to Manual or set correctly to time the cooking operation.
 - b. Switch turned on for wrong unit. Try all switches if in doubt. Read instruction book.

- c. Loose connection or broken wire in unit. If other parts of range have electric service, perhaps unit has failed. Call dealer regarding repair.
 - d. Defective switch. This will require a visit from a serviceman.
 - e. Oven unit terminal prongs not pushed firmly enough into receptacle in terminal block. The unit may need to be placed carefully in a guide before pushing firmly back into receptacle. Try replacing unit, being sure to push straight back firmly until unit terminal prongs are all the way in receptacle.
 - f. Burned off oven unit terminal prongs. Get serviceman to replace.
 - g. Burned out oven receptacle block. Get serviceman to replace.
 - h. Loose connection on oven terminal receptacle block. Get serviceman to tighten.
 - i. Broken or burned out oven unit coil. If open coil type, remove unit and examine carefully under good lighting. See 2c.
 - j. Inoperative thermostat, or loose thermostat connection. Get serviceman to repair.
3. If switch will not turn, it may be due to:
- a. Stuck or shorted contacts. Have serviceman replace switch.
 - b. Switch dial loose on stem. Turn to Off, remove dial, spread stem slightly and replace dial. If dial has set screw, tighten it.
4. If units do not turn off, it may be due to:
- a. Incorrectly set automatic timer. Examine setting and change.
 - b. Defective switch.
5. If equipment will not turn on and off automatically, it may be due to:
- a. An automatic timer needing repair. Use manual or switch control temporarily if timer needs repair. Call serviceman.
 - b. Timer being set incorrectly. Re-read instructions carefully.

6. If automatic time clock will not operate, it may be due to:
 - a. Stopping by outage. Reset. Most clocks are self-starting.
 - b. Loosening connection in cleaning. Call serviceman.
 - c. Using too high temperature and too much moisture in cooking. Have serviceman clean and repair clock.
 - d. Wearing clock by long usage. Have serviceman repair. Turning motor over will repair some clocks.
7. If time signal operates incorrectly, it may be due to:
 - a. Not turning timing hand on mechanical type far enough to wind spring tightly enough to have it operate correctly for short timing period. See range instruction book. For periods under five minutes, turn timer hand past 10 minutes, preferably up to 20 minutes, then back to time wanted.
 - b. Broken timer. Have serviceman repair. Or replace.
 - c. Disconnecting electrically operated type. See 6b.
8. If convenience outlet will not operate, it may be due to:
 - a. Loose or blown fuse. Screw in or replace with 15 ampere fuse if blown. To locate fuse look in storage compartment, removing drawers; or lift and look back of rear surface units.
 - b. Outlet being controlled by automatic timer. Set timer for manual operation, or set timer correctly.
 - c. An appliance needing repair. Check outlet with another appliance. If it operates, your appliance needs attention.
 - d. Loose wires at connection. Call serviceman.
 - e. Burned out receptacle. Call serviceman.
9. If lamps do not light, it may be due to:
 - a. Loose or blown fuse. See 8a.
 - b. Lamp loose in socket. Try tightening.
 - c. Burned out lamp. Replace.
 - d. Loose wiring connection. Call serviceman.
 - e. Defective lamp switch. Have replaced.

10. If range causes radio interference, it may be due to:
- a. Loose wiring connection. Call serviceman.
 - b. Oven unit terminal prongs with pitted or burned contact points. Moisture or loose connection causes this. Rub prongs with fine steel wool. Wipe very carefully to remove all steel wool. Oil with heavy grease or unsalted fat. Replace unit.
 - c. Burned oven unit receptacle. Have serviceman replace this.
 - d. Oven unit inserted loosely. This causes pitting of contact prongs. Have terminal prongs securely in terminal clips by pushing unit firmly into place.
 - e. Thermostat fluttering. Have serviceman check and replace.
11. If range hums, it may be due to:
- a. Loose wiring connection. See 10a.
 - b. Fluorescent lighting. The ballast may hum.

Problems on Range Appearance - Finish, Metal Parts

1. If the porcelain enamel on cooking top is crazed or checked, it may be due to:
- a. Washing the porcelain surface while hot, causing it to cool too quickly, thus resulting in crazing. The metal underneath and the surrounding porcelain enamel is subjected to strain. Let cool before washing.
 - b. Continuously using large surface pans extending over the rim of the unit onto the enamel. The high concentration of heat may eventually cause crazing, especially when pans have flanged or recessed bottoms. Raise unit on metal canning ring*, metal pieces or four 2-inch pieces of asbestos shingle over enamel and under rim of unit.
 - c. Overheating unit. If aluminum foil is used on reflector pan, be sure to make a hole in the foil to correspond with that in reflector pan.

*This is available for older models of range made by one manufacturer. In newer models unit tubes are raised to prevent overheating.

- d. Leakage of heat around loose-fitting oven door or during broiling. See that door is adjusted correctly. Usually this will not cause checking unless enamel is also washed while too hot. See a.
- 2. If the porcelain enamel on the surface top or sides is stained, it may be due to:
 - a. Failing to remove spilled foods containing acid such as fruit juices, tomatoes, tea, vinegar or milk. Bleach with a paste of borax or with a laundry bleach. Wash off thoroughly as soon as whitened.
 - b. Spilling strong alkali or acid on it. Use a mat or put a dish under these substances when used at range.
- 3. If the broiler pan is crazed or warped, it may be due to:
 - a. Putting cold water on hot broiler pan. The broiler pan should be allowed to cool before washing.
 - b. Leaving the broiler pan in the oven during preheating and removing it to a cold wet surface. Store broiler pan and rack in storage space, not in oven.
- 4. If well cooker lid is stained, it may be due to:
 - a. Turning lid upside down over well cooker utensil. Polish with very fine abrasive, like whiting mixed with vinegar, use aluminum polish or have lid buffed. New lids are not prohibitive in cost.
 - b. Putting wet dishcloth or pot holder on it. See a.
 - c. Using strong alkali on it. See a.
- 5. If metal parts are badly scratched, it may be due to:
 - a. Using harsh abrasive, cleansing powder or steel wool. See 4a.
 - b. Scraping with utensils or cutlery. Use wooden spoon to stir food in well cooker. See 4a.
- 6. If metal units and reflector pans of surface units are hard to keep clean, it may be due to:
 - a. Too high temperature for most cooking operations. Learn to turn switches to lower heats after cooking starts.
 - b. Careless timing in cooking of foods. This results in overheating which causes boilovers and spattering.

- c. Harsh abrasives or cleansers which have roughened surface. Cover reflectors with foil (put hole in bottom for safety). Or have aluminum reflectors buffed, or buy new reflector pans.
7. If metal parts rust, it may be due to:
- a. Scraping finish, exposing underneath metal to air. If in oven, rub off rust, clean and dry thoroughly. Coat with unsalted fat and heat oven at 500° F. until fat burns into surface. Thereafter, leave oven door ajar at broiling stop after using oven. This happens with older models of ranges.
 - b. Poor finish on range. Unless surface is bonderized under the heat-cured lacquers or paints, it rusts easily when scratched. To preserve finish, use mild cleansing agents and dry thoroughly after cleaning. Clean off any rust formed and coat area with special paint from dealer. Dry thoroughly before heating range again.

General Cooking Problems

1. If foods are not cooked satisfactorily when directions are followed in range instruction book, it may be due to:
- a. Incorrect timing directions or taking time given in instruction book too literally. The temperatures and times in the instruction book are only a guide and may be changed to suit family tastes. For improved health, however, sometimes it is wise to try to change family tastes instead. For example, slightly firm cooked vegetables have more vitamins than soft, very thoroughly cooked ones. They are also milder flavored.
 - b. Food too cold when starting to cook. Any food colder than room temperature requires extra time for cooking. However, frozen vegetables require less time because of partial cooking during preparation for freezing.
 - c. Incorrect switch or thermostat setting. Good lighting at range shows controls more clearly. Try a pin-to-wall lamp, preferably with metal shade or put a fluorescent pin-up under the cabinet, above the range, if there is a cabinet there.
 - d. Oven temperature control or thermostat needing adjustment. Call serviceman.
 - e. Pan unsuited for the amount or type of food being cooked. Various types and sizes of pans influence baking time. A pan having sides which extend very much above the top of the food product slows browning to such an extent that it takes a longer time to brown food. Dark pans or enamel

pans hasten browning and often result in food being too brown on bottom. Glass or pottery dishes also speed cooking in the oven.

- f. Pans too close together in oven. There should be an inch or more space between pans and about two inches between pans and oven walls to allow for air circulation and even heat distribution. This is not so important with covered pans and moist heat.
- g. Oven too full. It takes too long for the oven to regain the original temperature set for the cooking process. Try preheating 25 to 50° F. higher than temperature called for in recipe, if loading is apt to take overlong. A modern oven recovers such heat losses rapidly. Overloading may cause poor heat distribution

Well Cooker Difficulties

1. If food burns in well cooker, it may be due to:
 - a. Using too little water. For vegetables, fruits and nearly all meats except those for soup stock or stew, cover bottom of pan or use $\frac{1}{4}$ to $\frac{1}{2}$ cup, not over 1 cup of water. Use no water on greens; enough moisture clings to them from washing. Cover dried foods with water, and use plenty of water in cooking cereals.
 - b. Leaving switch on High too long. Turn down to lower heat when steam starts escaping, or, in frying, when food starts browning.
 - c. Timing foods incorrectly. Watch timing carefully especially when cooking in porcelain enamel utensils. Porcelain absorbs heat rapidly, and food sticks easily.
2. If flavor of vegetables interchange when preparing a complete vegetable dinner in the well cooker, it may be due to:
 - a. Failing to maintain an active flow of steam throughout cooking period. Follow manufacturer's instructions.
 - b. Turning unit off without first removing cover of well cooker when food is done.
 - c. Removing cover during cooking process and failing to turn switch to High until boiling point is reached again.
 - d. Allowing odorous foods to stand too long in cooker before cooking process begins.
 - e. Using too much water. See 1a.

3. If puddings are soggy on top, it may be due to:

- a. See 2a, 2b, 2c.
- b. Failing to place cover on insert pan to keep condensation out.
- c. Failing to place waxed paper or foil over insert pan if there is no insert pan cover to be used. If points under 2 are observed covering is not necessary.
- d. Timing cooking incorrectly or starting with very cold food. Cook longer. See 2c.

Oven Problems - Smoking, Staining, Poor Results

1. If oven smokes, it may be due to:

- a. Roasting or broiling at too high a temperature. This causes the fat to spatter and burn.
- b. Letting grease accumulate in oven. It smokes during preheating or high-temperature baking. Wash oven after roasting or broiling, or wipe with soft paper or dry cloth if very busy.
- c. Leaving spillovers of food on the bottom of the oven. These char or burn, causing smoke. Clean as soon as cool.

2. If there is moisture and staining around the oven door and oven vent, it may be due to:

- a. Using too much water. Most vegetables need only $\frac{1}{4}$ cup, at most for old or starchy vegetables $\frac{1}{2}$ cup water. Cover vegetables tightly. In a long-cooking oven meal, you can also cover a juicy cobbler; it will brown.
- b. Using too high temperature. Check thermostat setting. Thermostat may need adjusting if temperature is obviously higher than that for which set. See dealer.
- c. Putting meat and moist food too close to unit in broiling. Place top of food 2 to 3 inches from unit, or lower in oven.
- d. Obstructing oven vent. This will force steam out around oven door. Clean vent which usually leads to surface unit, center or some part in porcelain section of cooking top, or to front of backsplash. For further information on this, see instruction book, or call dealer. Some manufacturers' instructions say to avoid covering surface unit too closely if oven vent opens through it. A large overhanging pan with a recessed or flanged bottom might block flow of moisture and heat through surface unit.

3. If oven temperature seems to be wrong, it may be due to:
 - a. Using recipe with temperature given incorrectly. Check with recipes in other books.
 - b. Setting controls incorrectly. "Preheat" burns cakes on top. Time baking carefully.
 - c. Moving range and jarring oven thermostat or bending and damaging thermostat tube in cleaning. If the oven temperature control is out of adjustment, call a serviceman. Be careful of thermostat tube when cleaning oven. Modern thermostats are built rather ruggedly.

Broiler Problems

1. If broiled foods are too dry, it may be due to:
 - a. Meats containing very little or no fat. Brush these with melted fat before broiling. Use fat on dry vegetables.
 - b. Poor quality meat. Grind such meat, or use moist heat instead of dry broiler heat.
 - c. Incorrect type of meat for broiling. Broiling only tender meat or use ground less tender meat.
 - d. Broiler pan too far from unit. There should be 2 to 3 inches from top of meat to unit for most broiling. Thin meats go close to unit; thick meats farther away, especially if to be well done.
 - e. Poor timing of broiling process. Overcooking dries and toughens meat.
2. If unable to get steak browned while still rare, it may be due to:
 - a. See 1d.
 - b. Too thin steak. Steak should be at least 1 inch thick.

Oven Meal Problems

1. If vegetables cooked in oven are too dry, it may be due to:
 - a. Cooking vegetables uncovered. Cover all vegetables except baked or pan roasted ones. Brush pan roasted ones with fat.
 - b. Using a loose cover on a utensil. This allows steam to escape. Tighten by using a double layer of waxed paper or foil under cover; try another cover; or change utensil.

- c. Using too little water. Old or dry vegetables may take more than $\frac{1}{4}$ cup water. Try $\frac{3}{8}$ cup.
 - d. Choosing vegetables which are old or of poor quality. Use vegetables promptly, or keep in covered container in refrigerator if they seem to dry.
 - e. Cooking with temperature too high. This reason applies only with uncovered vegetables. Unless they boil dry, covered ones cook in steam at about 212° F. regardless of oven temperature. Variations in cooking time are due to utensil material and oven temperature, which affect starting rate; also to size of pieces, temperature and age or condition of vegetables.
2. If meat cooked in oven is too dry or not tender, it may be due to:
- a. Cooking less tender meat without a cover. Tender meat should be cooked uncovered. Less tender meat requires moisture for softening.
 - b. Cooking meat too long. Use meat thermometer. Figure timing by weight, and use automatic timer. Check results with meat thermometer.
 - c. Cooking meat at too high temperature. Use low or moderate temperature, 300° to 350° F.
3. If flour products and meats in an oven meal do not brown properly, it may be due to:
- a. Too much moisture or too many juicy foods in oven. Cover vegetables and stewing fruits, and cook in a small amount of water. Cook tender meat uncovered. Brown less tender cuts before adding water and covering, if heavy browning is desired.
 - b. Too low an oven temperature. Biscuits require higher temperature and cook separately from most oven meals.
4. If flour products in an oven meal are coarse textured, it may be due to:
- a. Baking flour products from cold start. Preheating gives better texture and about same volume. It is not necessary to preheat for yeast breads.
 - b. Using wrong type baking powder and let it start action too early by standing in warm place. Use double-acting baking powder if there is likely to be a delay.

Baking Difficulties

1. If cookies and biscuits burn on the bottom, it may be due to:
 - a. Setting temperature too high. Reset thermostat dial. Have a serviceman check oven temperature if it seems too high in all oven cooking. He can adjust thermostat.
 - b. Using cooky pan which is too large to allow proper distribution of heat. If pan touches side of oven or is so close that air circulation is obstructed, heat will concentrate on the bottom of pan.
 - c. Baking cookies in dark or discolored metal pans. Dark or enamelled surfaces absorb more heat than lighter or bright ones. Shorten cooking time or change pans. Or turn control to Broil and back to Baking to heat top unit just before putting each pan of cookies in oven; shorten time.
 - d. Using cooky pan having high sides. This prevents proper distribution of heat. Do not have sides of more than $\frac{1}{2}$ to 1 inch, preferably a flat sheet with no sides at all or $\frac{1}{4}$ inch ones. Turn pans over and place cookies on bottom if pans have high sides.
 - e. Buttering cooky sheet or pan. The sweet cookies burn easily.
 - f. Placing pans improperly. If pans are too close together and directly above each other, heat will not circulate well. Relocate shelves. If pans are very large, try switching positions half way through baking period. Or start baking on bottom shelf using one pan and adding second when first batch is half through baking. Raise first batch to upper shelf when adding second. Continue process.
 - g. Placing shelf too low in oven. Try a higher position.
2. If cakes do not brown on top, it may be due to:
 - a. Too low baking temperature.
 - b. Poor placement of pans. Relocate pans, staggering for good heat circulation.
 - c. Pan too deep for amount of batter used. The high sides act as a baffle and cause uneven browning. Try a smaller pan.
 - d. See 1g. When baking a single cake, center it in the oven.

3. If cakes are too brown on the bottom, it may be due to:

- a. Baking them at too high a temperature.
- b. Placing shelf too close to bottom unit. Center a single cake or two. For more, arrange shelves to put cakes about equidistant from units and from each other. This is not so important in some newer models of ranges.
- c. Using dark pans which absorb too much heat on the bottom. Or using pans which are not clean. See 1c. Buffing will clean baked-on stain from aluminum. Fine steel wool (000) also removes stain.
- d. Using glass dishes or enamel pans. These cause food to brown more quickly than tin or aluminum. Shorten cooking period, or lower temperature about 25° F.
- e. See 1g. Raise shelf.
- f. Top oven unit not making contact. Push in firmly.
- g. Baking them in pans too deep or too large. Food burns on bottom before brown on top. See 2c.

4. If a cake burns in some part of the oven, it may be due to:

- a. Placing pans touching oven wall or each other. See 1f.
- b. Opening oven door too often. Set thermostat dial, and notice time or set time signal or alarm clock; then do not open oven door during baking period.
- c. Using a dark pan which browns cake on bottom and sides more than a bright pan. Avoid using different types of pans at the same time for the same cake batter.
- d. Damaging door so it fits improperly. Test for tight fit at top and sides with paper. Bottom should have small space of about 1/16 to 1/8 inch. Check in several spots by closing door on a wad of gum between wrappers. Be sure to have adjusted correctly, probably by a serviceman.
- e. Moving range so it is not level. Test by using a level or a large pan of water on oven shelf. Place tapered wooden pieces-(shims) or metal discs under corners of base on low side. Some ranges have adjustable levellers. Dealer should level range when installing it.
- f. Timing cake incorrectly and leaving in too long. Set time signal or alarm clock as reminder to remove cake.

5. If cakes rise and bake unevenly, it may be due to:
 - a. Placing shelves, or pans unevenly.
 - b. Moving range so it is not level. See 4c.
 - c. Baking in bent or warped pans. Straighten or get new ones.
 - d. See 4a, 4b and 4d.
 - e. Letting oven vent become clogged or blocked. Clean carefully. Check for blocking by pan if it opens through surface unit.
 - f. Spreading batter unevenly. Level batter, or strike pan sharply on table to level and to remove air bubbles.
6. If cakes shrink excessively from sides of pan while baking, it may be due to:
 - a. Improper proportions. Try another recipe or measure more carefully.
 - b. Glass and enamel pans which bake cakes browner on the sides and bottom. Lower temperature 25° or shorten time.
 - c. Temperature too low or too high. Follow tested recipe.
 - d. Baking period too long. Follow tested recipe and time carefully.
7. If cake recipe used formerly does not rise now, as before, it may be due to:
 - a. Using wrong recipe or poorly proportioned recipe. Check recipe used with standard recipe in range instruction book or a good cook book.
 - b. Using baking powder which is old or has been left uncovered, or a different kind of baking powder than previously used.
 - c. Not using recipe for some time and forgetting result.
 - d. Changing procedure, quantities, time or temperature.
 - e. Mixing cake with different device. Shorten mixing time with electric mixer; see mixer instruction book for directions.

8. If cakes brown too quickly and do not bake through, it may be due to:
 - a. Setting temperature control dial too high or thermostat needing adjustment.
 - b. Using wrong pan material. Change to bright pans. See 6b.
 - c. Baking cake with oven on "Preheat" position part of time.
9. If pies do not brown on the bottom, it may be due to:
 - a. Using pan with very shiny bottom. This retards browning.
 - b. Placing pans in wrong position in the oven. Obstructing heat flow by baking sheet or pan used to avoid spillovers. Allow room for heated air to circulate.
 - c. Having temperature too low.
 - d. Rolling too much flour into crust.
 - e. Using too much water.
10. If pies cook over in the oven, it may be due to:
 - a. Using too high temperature. See 1a.
 - b. Putting too much filling in pie.
 - c. Not sealing pastry edges, or using patched pie crust.
 - d. Using too much sugar or too much liquid. Use tested recipes and follow accurately. Try pie funnel or newer type of pans.
 - e. Using utensil which is too small. See 10b also.
11. If pies burn around edges, it may be due to:
 - a. Baking with temperature too high for too long a time.
 - b. Rolling pastry too thin on edges.
 - c. Filling oven too full and having pans touch oven lining. See 1f.

ADVANTAGES OF USING ELECTRICITY FOR COOKING

The main points which apply are listed below under the advantages commonly thought of in connection with cooking on the electric range.

ACCURATE;

1. Thermostat: The oven thermostat turns electricity on and off automatically to maintain the temperature for which it is set. Some well cookers are thermostatically controlled. And eventually we may have surface units which are also thermostatically controlled, for these have already been developed. For accuracy, a thermostat should be properly checked and calibrated when installed. It will then give the temperature for which it is set within range of 20 to 25° F. above or below the temperature set. This is close enough that cooking results will not be affected. The time required to reach the temperature set may vary slightly with variations in initial temperature, oven load, and voltage. Baking two layer cakes is a good oven check. See p 24.
2. Switches: The same switch setting on the same unit gives the same amount of heat each time it is used, unless voltage changes. If voltage in the circuit is low, less heat is produced. Under these conditions longer time will be required for the operations performed, but the end results will be satisfactory.
3. Time control: The time at which some heating units of a range turn on or off can be controlled automatically. This may be done by the setting of a timer clock, or a combined singal-timer, provided a range has either type of equipment

AUTOMATIC;

1. Thermostat: The thermostat automatically maintains the temperature set. Thermostats control all electric range ovens and one type of portable accessory well cooker for a range. A thermostat requires no attention on the part of the user except setting dial properly.
2. Preheating: Most ranges now automatically switch from oven preheating to oven baking.
3. Time control: With a selector switch you can choose the part of the range which you want automatically turned on by the automatic time control. Parts which may be timer controlled include: oven, well cooker, appliance outlet, one or two units and a heater-cooler installed in range storage space. The automatic timer will both turn electricity on and off.
4. Cooker switch: One range has a well cooker with an automatic switch. Set the switch for the number of minutes cooking wanted on High and at the end of the time chosen, it automatically switches to Low.

ATTRACTIVE:

1. Finish: The white porcelain enamel finish used on most ranges harmonizes with other equipment in the kitchen, such as sinks, refrigerators and white cabinets.

2. Color: White reflects a lot of light which gives cheer and brightness in the room.
3. Height: Table-top ranges are 36 inches tall. They match other kitchen equipment in height. This gives a hospitable, horizontal line to the kitchen, an essential of good design recognized in modern architecture.
4. Design: Most ranges are simple and well balanced in design. Their functional rounded corners, smooth curved joinings and other features fit in with modern standards of appearance. Beautifully designed, well-balanced and nicely trimmed, ranges are available.

CLEAN:

1. No burning by-products: Heat from an electric range does not depend on combustion taking place in the range. Therefore, there is no soot, smoke, fumes, carbon dioxide or moisture. There is no fuel supply problem, no wood boxes to fill, no ashes and cinders to remove. This eliminates a lot of dirt.
2. Accurate control: When electricity is used properly in cooking, there should be little cleaning, curtain washing, or redecoration due to cooking, and none due to by-products of burning. Little or no cleaning and scrubbing of cooking utensils is required when the range is properly used.
3. No cracks: Well-designed ranges are free of crevices and cracks which collect dirt.
4. Smooth enamel: Porcelain enamel is a hard glass-like surface, free of large pores or roughness which might hold dirt. Range tops, exteriors and oven liners are finished in porcelain enamel.
5. No rusting: Bonderizing of metal before finishing, and good finishes, practically eliminate rusting in electric ranges.

COOL:

1. Conduction: From a surface unit, heat goes directly into the bottom of a pan in contact with the unit. With proper sized pans and correct control of heat by switches, there is little loss of heat around the pans.
2. Oven controls: Automatic preheating prevents overheating during the preheating period, and the thermostat regulates the temperature evenly.
3. Insulation: Insulation on all six sides of the oven holds heat well.
4. Attention unnecessary: Accurate and automatic heat control by a thermostat and proper switch settings, combined with good timing, always produces the same excellent results. This makes peeking and stirring unnecessary, eliminating heat loss into the room to a large extent.
5. No burning: There is no moisture given off, no warm heated air circulated as a result of combustion, for there is no combustion.

CONVENIENT:

1. Electric energy: By turning a switch, it is possible to start the flow of electricity which produces heat. There are no fires to build, no matches or fuel needed.
2. Timer: Automatic timing is a convenience, if one is busy or away from home or outdoors at the time cooking should start, or stop. See "Automatic."
3. Thermostat: Thermostat and other controls are durable and operate properly when set correctly.
4. Controlled heat: Low controllable heat on surface units eliminates the need for double boilers, constant stirring and watching of food.
5. Cleanliness: Cleanliness of range utensils is a convenience. See "Clean."

DEPENDABLE:

1. Durable tubular units: Boilovers have no effect on tube units. Air cannot reach wires inside of these tubes.
2. Draft-proof units: Draft or air on the units cannot stop the flow of electricity to the range.
3. Availability of electricity: Electricity is always available to produce heat in the range, except in the case of an outage. Such instances are rare and electric service is usually promptly restored.

DURABLE:

1. Unit-body construction: Most electric ranges are made with an all-in-one-piece frame of heavy gauge sheet steel, strengthened with welded steel supports. This makes a rigid, sturdy frame for the range. It also helps to eliminate chipping of enamel.
2. Welded or one-piece parts: Oven liners and several other parts are stamped in one-piece or welded along seams.
3. Acid-resistant tops: The cooking tops of all models of ranges made by present-day range manufacturers are finished in acid-resisting porcelain enamel. This statement is based on a survey of over 160 1949 models. Acid-resisting enamel is resistant to common food stains.
4. Porcelain exteriors and liners: The sides of nearly all present day ranges are porcelain enamel. Oven liners are also porcelain enamel, with the exception of one chromium plated model. In some ranges all interior and exterior surfaces are porcelain enamel. The new titanium porcelain finish is claimed to be superior.
5. Heat-cured paint: In most ranges, the less-used interior parts are finished in heat-cured paint or lacquer. This is the type finish used, and proven durable, on refrigerators and automobile bodies. It is sometimes called baked-on enamel, synthetic enamel or resin.
6. Bonderizing: Bonderizing, or coating steel with iron phosphate, is a treatment commonly given before finishing. It makes the steel rust resisting.
7. Tubular units: All surface units on present-day ranges are tube units. The tube is made of an alloy of nickel, chromium and iron. This outer cover protects the current-carrying wire coil from air, household chemicals and mechanical injury.

ECONOMICAL:

1. Oven insulation and heat control: All range ovens have six insulated sides and thermostatic control. Because of this, an oven uses electricity only part of the time to hold it at the temperature for which it is set.
2. Timer: An automatic timer makes it possible to turn the oven off before the end of the cooking time. Cooking finishes on stored heat even though you are not in the kitchen at the time. Some other units are also automatically controlled by the timer or by an automatic switch. An example of this is found in one well cooker which automatically turns itself from High to Low. A timer saves time and attention.
3. Thermostat: A properly adjusted thermostat eliminates food losses due to incorrect temperature.
4. Time signal: Time signals and time controls help to eliminate food losses due to careless timing of cooking.
5. Little water: Accurate control of surface units makes the use of small amounts of water in cooking possible. Food cooks faster in small amounts of water, and hence the cost of cooking is less.
6. Cleanliness: It is possible to save money on cleaning materials, on paint for the kitchen and in wear and tear on utensils and fabrics because of electric heat's cleanliness.
7. Retained heat: Heat retained in the oven, in surface units or in the well cooker can finish many cooking processes. Retained oven heat can be used for starting some low-temperature cooking operations or soaking dried foods.
8. Efficiency: Electricity has high thermal efficiency. See "Efficient."

EFFICIENT:

1. Efficiency tests: Tests performed a number of years ago by Purdue University showed electricity having a thermal efficiency of 83.3 percent in heating 16 pounds of water to boiling. Some tests at Iowa State College showed 63 percent thermal efficiency for electricity in heating about 1½ pounds of water. This is high compared with other sources of heat.
2. Conduction: Conduction is an efficient method of transferring heat. This is the main method used in transferring heat from surface and well cooker units to utensils.
3. Control: Accurate switch and oven control helps give efficiency in cooking.

FAST:

1. Current instantaneous: Electric current flows instantly at the turn of a switch.
2. Low thermal mass: Light-weight units of low thermal mass heat rapidly.
3. High wattage units: High-wattage units on modern ranges furnish heat as rapidly as food can absorb or conduct it. Food cooked under pressure will cook faster. Also, electronic cooking cooks food more rapidly.

4. Supercharger device: Superchargers on units, already developed but not yet being marketed, will use about 4,800 watts for instantaneous heating of a 1,200 watt unit. This will make the already rapid heating of surface units still more rapid.
5. Little water: Small amounts of water, possible with controlled electric heat, steam rapidly and start cooking quickly.

HEALTHFUL:

1. No combustion: Electricity produces heat without combustion. Therefore oxygen is not removed from the air, nor are noxious fumes created.
2. Controlled heat: Little or no water is needed when food is cooked by controlled heat and in tightly covered utensils. No stirring or peeking which lets air enter, is necessary. Controlled heat makes accurate timing simple, obviates overheating and overcooking.
3. Accurate timing: If the range is equipped with them, a time signal and/or an automatic timer help eliminate overcooking which causes unnecessary vitamin loss.
4. Cooking methods: In a recent study where electrical cooking methods along with a good handling and well-balanced meal program was initiated, definite health improvements, as determined by medical ratings, were shown. This study was conducted under the supervision of Dr. Pauline Beery Mack of Pennsylvania State College.

SAFE:

1. UL approval: Electrical equipment carrying the UL seal of approval of the Underwriters' Laboratories, Inc., meets standards of safety related to fire hazard and electrical shock.
2. Code requirements: Installation in accordance with National Electrical Code and local codes assures safety.
3. Grounding: The range is grounded to prevent shock hazard.
4. Dependability: Electricity will flow through the wires and produce heat regardless of water or food spilled, or air blowing on units. On rare occasions an older type open unit may fail due to food spillage. Modern surface units are unaffected by external factors. Even if electric current stops flowing due to an outage, there is no hazard.
5. No flame: There is no flame nor gases to produce a hazard.

SIMPLE:

1. Switch: Switch controls, which always produce the same results and are easily manipulated, provide a simple easy way of getting and controlling heat for cooking.
2. Thermostat: The thermostat makes controlling oven temperature simple. Once set, it needs no further attention.
3. Timer: Newer types of timers are easy to set and make starting and stopping cooking simple.

TIME RELEASING:

1. Timer: The automatic timer eliminates being present when cooking starts or stops.
2. Time signal: A time signal on the electric range serves as a reminder and lets you leave the kitchen while cooking.
3. Controlled heat: Low controlled heat, used whenever possible, releases time required by watching.

TIME SAVING:

1. Availability of energy: Electricity is readily available. With electric range, no time is used in getting fuel or disposing of burned by-products.
2. Cleanliness: Purdue University reports that it is possible to save 150 hours per year, or about $\frac{1}{2}$ hour per day, by using an electric range as compared with a wood range. Wood and coal range care took 3 hours and 2 minutes per week as compared with an electric range taking 26 minutes.

USEFUL:

1. Flexibility: The various parts of the electric range have a wide variety of uses.
2. Longevity: The expected life of electric ranges is estimated at around 15 years. During this period most of them give fairly trouble-free service. Tubular encased range units commonly used now are very durable and last much longer than earlier open types.

The National Manufacturers' Association has set 50,000 cycles for the minimum life of the range thermostat. Most thermostats are tested for an expected life of 7 to 10 years. Unless there is severe abuse, most of them will last much longer than their rated life. Some are known to have been in steady use for more than 20 years.

DEFINITIONS*

Household Electric Range - A household electric range is an assembly, consisting of electrically heated surface units and one or more oven and intended primarily for domestic use.

Model - A model is a particular range type, differentiated from other types by difference in size, structure, styling or integral auxiliary devices contributing to convenience or utility.

Range Name plate - The range name plate is the name plate on which the rating and identification of the complete electric range appears.

Porcelain Enamel - Porcelain enamel is a vitreous material fired on the surface of the metal.

Acid-Resistant Enamel - Acid-resistant enamel is a porcelain enamel which is resistant to ordinary food acids.

Heating Element - A heating element is a length of resistance wire (usually coiled) connected between terminals and used to generate heat electrically.

Heating Unit - A heating unit is a structure containing one or more heating elements, electrical terminals or leads, electrical insulation, and frame casing or other suitable supporting means, all assembled together into a unit.

Surface Unit - A surface unit is a heating unit mounted on a cooking top on which utensils may be placed for cooking.

Surface Unit Leads - Surface unit leads are wires from switches to surface units.

Cooking Top - The cooking top is the horizontal surface of the range in which the surface units are mounted.

Back Splasher - The back splasher is the vertical back surface extending above the cooking top.

Time Reminder - A time reminder is a device which will ring a bell or give other warning at the end of a preselected period of time.

Appliance Outlet - An appliance outlet is an outlet mounted on the range and to which a portable appliance may be connected by means of an attachment plug.

* These are the definitions given for range parts in the National Electrical Manufacturers Association's adopted standards. NEMA 155 E. 44th St., N.Y. 50¢.

Cooker - The cooker is a self-contained unit built into the range and consists of a heater element with an insulated container designed to retain heat for a considerable period of time.

Indicating Lamp - An indicating lamp is a lamp which indicates whether a circuit is on or off.

Range Lamp - A range lamp is a lamp attached to the range to illuminate the cooking top.

Condiment Set - A condiment set consists of shakers for salt, pepper, etc.

Drip Tray - The drip tray is the tray under the surface units intended to catch spillage.

Usable Baking Space - The clear usable baking space of an oven shall be considered as:

Height - The distance between the top of the shelf in lowest position and the top of the oven or the bottom of the upper unit, if one is provided.

Width - The distance between the edges of the shelf supports.

Depth - Inside front to back with door closed.

The space occupied by thermostats to the side or rear of an oven or other minor irregularities shall not be considered in determining the over-all dimensions.

Oven - An oven is any closed chamber in a range in which baking, broiling, roasting or toasting may be done.

If two separate chambers are provided, as in a double oven range, the one intended primarily for baking shall be known as the baking oven.

If two separate chambers are provided, as in a double oven range, the one intended for broiling shall be known as the broiling oven.

If a single chamber is provided for both broiling and baking, it shall be known as a combination oven.

Thermostat - A thermostat is a device which regulates the electrical input in response to changes in temperature.

Heating Cycle - A heating cycle is one complete operation of the thermostat from "on" to "on" or from "off" to "off."

Oven Light - An oven light is a lamp inside the oven to illuminate the interior.

Shelf - A shelf is a support for cooking utensils in an oven, warming compartment or broiler.

Oven Shelf Support - An oven shelf support consists of the facilities provided on the oven lining to support the oven shelf.

Lock Stop - A lock stop is a reasonable stop to prevent oven shelves from being pulled completely out unintentionally.

Guard Rail - A guard rail is the rail across the rear of an oven shelf.

Oven Door - An oven door is any oven door, whether on a broiling oven, baking oven or combination oven.

Latch - A latch is a device used to hold a door tentatively in the closed position.

Broiling Stop - A broiling stop is a device to hold the oven door partially open.

Broiler Pan - A broiler pan is a pan which fits underneath the broiler rack to catch the juices.

Broiler Rack - A broiler rack is a framework which fits into a broiler pan to support the food to be broiled and which provides drainage for the juices.

Warming Compartment - A warming compartment is a closed compartment fitted with a heating unit in which dishes or other items may be warmed.

Drawer - A drawer is a pull-out storage space.

Supply Circuit - The supply circuit is the circuit which is the source of the electric energy used by the range.

Grounding Jumper - A grounding jumper is a strap or wire used to connect the frame of the range to the neutral terminal.

Range Cord Sets - A range cord set is a cord and plug assembly intended for use in connecting three-wire, single-phase, alternating current ranges of 118/236-volt design which are rated in excess of 7,500 watts but not in excess of 15,000 watts.

The assembly shall consist of two No. 8 and one No. 10 conductors with an insulation equivalent to Type K Cord, three terminal lugs and a polarized plug. One of the No. 8 conductors shall be colored red and one shall be colored black. The No. 10 conductor (common or neutral) shall be colored white.

The conductors shall be 38 inches long, shall terminate at one end in 60-ampere terminal lugs, and shall be properly connected at the other end to a polarized 50-ampere, 250-volt plug having dimensions in accordance with NEMA standards.

Note: This standard does not require that ranges for which the cord set is primarily intended be so equipped; nor does it preclude the use of a standard cord set on other range designs, types and sizes not here specified.

RANGE STANDARDS AND SPECIFICATIONS

NEMA: "Test Specifications for Household Electric Ranges," NEMA Publication No. 108; 1940, 50¢. Numerous supplements at 10¢ each. NEMA, 155 East 44th Street, New York 17, New York.

The standards describe a uniform testing procedure, provide definitions and specify test conditions for the determination of safety, performance, durability, construction, and convenience for household electric ranges. It also includes standards for voltage ratings of range elements and their adaptation to electric supply circuits.

BHNHE: "Tentative Procedures for Baking of Biscuits, Bread, Layer Cake and Sponge Cake, BHNHE Publication No. 317-B; 1949. BHNHE, USDA, Washington 25, D. C.

This mimeographed release describes tests of range performance by cooking. It includes recipes, mixing techniques and testing methods. A Mundell color card is used to check results.

American Standards Association, 29 West 39th Street, New York, New York.

Standards for electric ranges are being developed. The above NEMA and BHNHE publications may become a part of the standard testing procedure being set up.

Thermostats: A number of nationally recognized organizations have set up minimum requirements for thermostats. Such organizations are American Standards Association, National Bureau of Standards, some professional engineering societies, and national testing organizations of which Underwriters' Laboratories is an example. Most manufacturers require approval of their thermostats by one of these organizations before their thermostatically controlled equipment is placed on the market.

